THE AMERICAN ENGINEER

SEPTEMBER, 1935

PUBLISHED BY

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THE FIRST CONVENTION

National Society of Professional Engineers to Meet in Columbus, Ohio October 23rd, 24th and 25th

National Council of State Boards of Engineering Examiners Also Convenes on Same Dates

Headquarters—Hotel Deschler-Walleck

ON October 23rd, 24th and 25th, there will take place in Columbus, Ohio, the first convention, composed entirely of professional engineers, ever held in this country. This convention promises to be a milestone in the history of the calling which has contributed so much to the civilization, material though it be, of these United States.

Over a period of ten years there has been developing a national professional engineering movement organized after the governmental pattern of county, state and nation. While the legal and medical professions have long since appreciated, with obvious results, the political framework type of organization, engineering societies, oblivious to the fact that members are citizens as well as engineers, have until recently closed their eyes to the advantages and obligations of an organized profession. The misfortunes of the past six years are in no small measure attributable to the indifference and narrow vision of engineering societies, who, as the voices of a great profession which had created wealth beyond the need of mankind, have neglected to warn society that adequate distribution of wealth cannot be effected without engineering administration. Public recognition of this principle can only be secured through unselfish, concerted and carefully directed endeavor upon the part of an organized profession. Such is the great purpose of the confederation of county and state units known as the National Society of Professional Engineers.

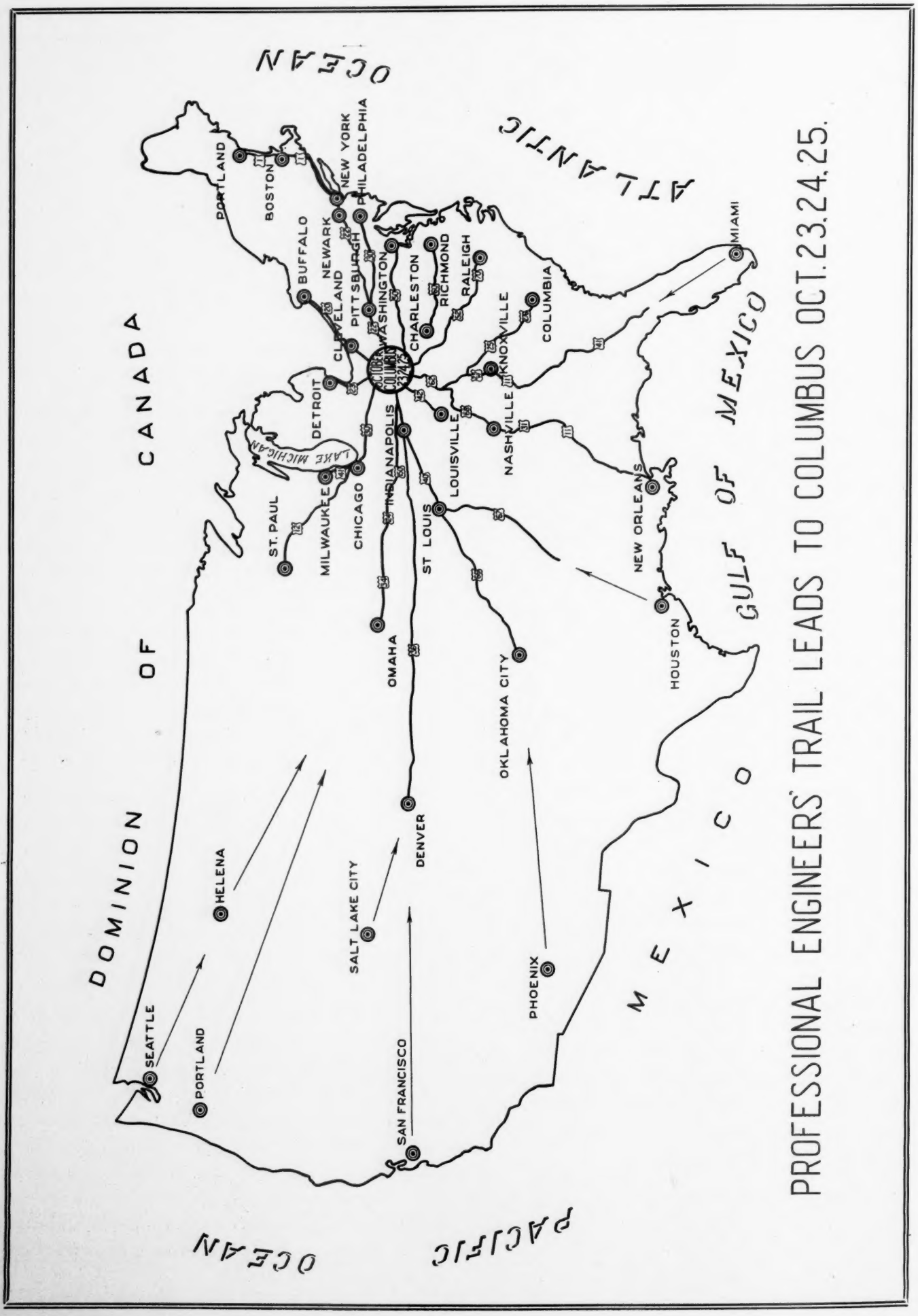
Elaborate plans, under the direction of a most able Chairman, Engineer Perry Ford of Ohio, have been prepared by the Convention Committee. Leaders in the affairs of government, national and local, will address the convention, which will have neither technical nor scientific sessions. All discussions and deliberations will deal with professional, social and economic problems affecting the nation and the engineer. The selection, the training, the requirements, the aspirations, the rewards and the professional and civic responsibilities of engineers will be the subject of discussion by both engineers and laymen.

The annual meeting of the National Council of State Boards of Engineering Examiners, which takes place coincidently, will, with courtesy arrangements afford engineers an opportunity to attend sessions of the officials selected by the several states to administer their respective licensing laws.

The Ohio Society of Professional Engineers will act as host to both the National Society and the National Council.

Round trip railroad fares at one and one-third single rates can be secured from all lines reaching Columbus. Such reductions may be arranged at the point of embarkation or through the State Society. Elsewhere in this issue are additional details relevant to the convention and the means of reaching the same.

Every chapter of every state society is expected to SEND at least one official representative to the first convention of the National Society of Professional Engineers. Every state organization is expected to assume responsibility for chapter attendance. Every engineer who can sacrifice the time and money will be well rewarded for his attendance at the convention. Perry Ford and his Ohio Society colleagues promise a real vacation as well as a valuable experience for those who make the trip.


PROFESSIONAL ENGINEERS' TRAIL LEADS TO COLUMBUS OCT. 23.24.25.
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GULF OF MEXICO
DOMINION OF CANADA
PACIFIC OCEAN
MEXICO
PORTLAND
BOSTON
NEW YORK
PHILADELPHIA
BUFFALO
NEWARK
CLEVELAND
PITTSBURGH
WASHINGTON
CHARLESTON
RICHMOND
RALEIGH
MIAMI
COLUMBIA
KNOXVILLE
DETROIT
LAKE MICHIGAN
ST. PAUL
MILWAUKEE
CHICAGO
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PORTLAND
HELENA
SALT LAKE CITY
DENVER
SAN FRANCISCO
PHOENIX

THE NATIONAL SOCIETY OF PROFESSIONAL ENGINEERS

What it and its Member Societies Have Accomplished to Date

A Response by

D. B. STEINMAN, PRESIDENT

In anticipation of inquiry from interested, uninformed or critical sources the President sets forth herewith some of the more important accomplishments of the National Society of Professional Engineers and its member State Societies during its brief existence of one year.

These accomplishments, as set forth by Engineer Steinman, are as follows:

THE NATIONAL SOCIETY

1. In 1934, stimulated and assisted in the organization of State Societies of Professional Engineers in four additional States (Pennsylvania, Connecticut, West Virginia, and Kentucky).

2. In 1935, inspired existing engineering societies in two States to reorganize as State Societies of Professional Engineers (Ohio and Utah).

3. In 1935, successfully assisted six additional States in securing engineers' registration laws (New Mexico, Washington, Utah, Maine, Oklahoma, and Connecticut), increasing the number of registration states from 27 to 33.

4. In 1935, assisted ten additional States in drafting engineers' registration laws and in organizing for their enactment. (Illinois, Kentucky, Texas, Nebraska, Missouri, Massachusetts, Alabama, Georgia, Maryland, and Delaware).

5. In 1934 and 1935, brought eight State Societies of Professional Engineers together in mutual cooperation as Member State Societies of the National Society of Professional Engineers.

6. In 1935, organized a District of Columbia Society of Professional Engineers, with the Chief Engineers of Government Departments as charter members.

7. In 1935, secured the active cooperation of the Associated Press, the United Press, and individual newspapers in our campaign to restrict the designation "engineer" to the members of our profession and to substitute the designation "engineman" for those who operate locomotives or engines.

8. In 1935, secured the agreement of the U. S. Department of Labor to cooperate in our campaign to restrict the designation "engineer" and to designate engine-operators as "enginemen" in future Government statistical classifications and public reports.

9. In 1935, carried on a publicity campaign in newspapers in various parts of the country in order to advance Society objectives.

10. In 1935, launched a campaign to secure the establishment of a permanent Department of Public Works in the National Government, to be headed by an engineer in the President's Cabinet as Secretary of Public Works, and supported legislation (S.2665) subsequently introduced toward that objective.

11. In 1935, established the publication of the "American Engineer" as a national non-technical magazine, devoted to the professional, social and economic interests of the engineer, and having an initial circulation of over 4,000.

12. In 1935, established National Headquarters at Washington, D. C., to serve as a point of contact, on behalf of all professional engineers, with legislators and Government authorities at the Nation's capital.

13. In 1935, Washington office placed its services freely at the disposal of unemployed professional engineers to establish contacts with available appointments in Federal departments and agencies.

14. In 1935, successfully opposed legislation (S.2994) which was introduced in Congress on behalf of the legal profession and which would have deprived engineers and others of the right to appear for clients and organizations at hearings before Governmental boards or agencies.

15. In 1935, successfully assisted Member State Societies in securing legislation to improve their existing registration laws and in opposing legislation jeopardizing the interests of our profession. (Pennsylvania, New York, and Ohio).

16. In less than a year after the organization of the National Society of Professional Engineers, more progress was recorded in extending engineers' registration legislation than in the ten years preceding.

State Societies With the Assistance and Stimulation of the National Society

OHIO

1. In 1935, the Ohio Society of Professional Engineers successfully and effectively organized the professional engineers throughout the State into 28 local chapters, covering all of the 88 Counties of Ohio and ranging in membership from 43 to 735.

2. In 1935, the Ohio Society secured legislation (S.174) strengthening the engineers' registration law and providing that all funds collected from registration fees shall be retained by the State Board of Registration and shall be used exclusively for the benefit of the registered engineers.

3. In 1935, the Ohio Society secured legislation (H.97) changing the official designation of "County Surveyor" to "County Engineer" and establishing the requirement that, in the future, every "County Engineer" must be a registered professional engineer and surveyor.

4. In 1935, the Ohio Society successfully stopped legislation (S.58) designed to exempt insurance com-

(*Continued on page* 25)

Programme

ANNUAL CONVENTIONS

of

The National Council of State Boards of Engineering Examiners

and

The National Society of Professional Engineers

As Prepared by T. Keith Legare and Perry Ford

WEDNESDAY, OCTOBER 23, 1935		WEDNESDAY, OCTOBER 23, 1935	
9:00 A. M.	Registration of Delegates and Guests	9:00 A. M.	Registration of Delegates and Guests
10:00	Business Session	10:00	Business Session
11:00		11:00	Appointment of Committees by President
12:30 P. M.	Lunch	12:30 P. M.	Lunch
2:00 P. M.	Welcome by Governor and Mayor Response by	2:00 P. M.	Joint Session for Welcome Addresses Response by
2:30	Business Session	2:30	Business Session
4:30	Committee Meetings	4:30	Address
7:30	Annual Dinner (Guests of State Board and Ohio Society of Professional Engineers) Entertainment and Get Acquainted		

THURSDAY, OCTOBER 24, 1935		THURSDAY, OCTOBER 24, 1935	
9:30 A. M.	Business Session	9:30 A. M.	Business Session
12:30 P. M.	Lunch	11:00	Address
2:30 P. M.	Business Session	12:30 P. M.	Lunch
3:30		2:30 P. M.	Business Session
5:00	Adjournment	3:30	Address
		5:00	
6:30	Professional Engineers Banquet	(Extraordinary)	National Speakers (Entertainment)

FRIDAY, OCTOBER 25, 1935		FRIDAY, OCTOBER 25, 1935	
9:30 A. M.	Report of Committees	9:30 A. M.	Report of Committees
10:30	Sight Seeing Trip	10:30	Sight Seeing Trip

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Convention Headquarters—Hotel Deschler-Walleck, Columbus, Ohio

THE 74TH CONGRESS

Legislation of Interest to Engineers

A Brief Summary and Comments Thereon

By
ALFRED W. SAYRE

THE Acts of the recently adjourned Congress were so diversified and so numerous as to leave the impression that there was some legislation to suit everybody, and a lot to suit some. However, the outstanding characteristic of the last weeks of the session seemed to be the high pressure everywhere apparent. One might almost say that when the body did adjourn, it was as if the valves were opened suddenly, the pressure let out, and Congress sent home with a great deal of pending legislation still to be enacted.

To most engineers it must seem surprising that national Statute books still lack so many laws that at every session the mill has to work overtime to try and complete the statutes under which the nation lives. It appears however that to-day this is not quite the case. We have seen in this Congress the inauguration of acknowledgedly experimental legislation, admittedly passed in order that its constitutionality might be tested. Perhaps this has always been the procedure. However we were not told and did not know it. In any event the engineer should not criticize for he himself engages in much experimental work. Why should the lawyer not do likewise? And it is highly probable that if there were in Congress as many engineers as there are lawyers, and as few lawyers as there are engineers, we would witness a great deal more experimental legislation, and perhaps be able to convince the public that since the effect on the body politic of any enactment is always unknown, legislation might as well be acknowledged as experimental in the first place.

In the following summary and comment, a quick attempt is made to place certain Acts in the order of their importance to professional engineers. The arrangement selected may be surprising to some engineers, who seem to think that practically the only "New Deal" agencies of interest to the engineer are PWA, WPA and TVA, and interest in them is solely for the purpose of securing a personal appointment. It is rather critical of the attitude of the average professional engineer to say that he has lately had the attitude of expecting Washington to release something which will give him a job, instead of studying the legislative unfoldment as a whole, and developing a job in his own territory.

The NRA Extension Act

Extends the NRA in skeletonized form until April 1, 1936.

This act was probably passed for the purpose of ultimately setting up a system of Federal licensing of interstate business, and may eventually contain provisions for the Federal registration of professional and technical people. Under the old NRA, it very nearly came about that architects, engineers, and technicians were required to be registered. Chemists were required to be registered and minimum wages were cited—but not maximums. The effect of citing a minimum wage in an enactment such as that, is to draw the whole profession down to that wage. Professional engineers should watch the forthcoming development of NRA for its possible effect on their legal status.

Before the NRA, an opportunity existed for the engineering profession to head up the myriad of trade associations in this country, which finally associated themselves with the U. S. Chamber of Commerce and the American Trade Association Executives. Also having a finger in the trade-association pie were the U. S. Department of Commerce and the Federal Trade Commission. Had there been a unified executive for the trade association movement in this country, no NRA would have been necessary. The professional engineers might have developed and held this executive role but the profession seems doomed never to be big enough for such opportunities. Yet we professional engineers complain chronically that lawyers direct our lives!

The Work-Relief Act

Appropriates 4 billions of dollars to be used "in the discretion and under the direction of the President to provide relief, work-relief, and to increase employment by providing for useful projects." This appropriation covers eight general classifications which include every possible line of public work, such as:

Highways, (roads, streets, grade crossing elimination) rural rehabilitation, relief in stricken agricultural areas, water conservation, transmountain water diversion, irrigation, reclamation; rural electrification; housing; assistance for educational, professional and clerical persons; Civilian Conservation Corps; loans and grants for self-liquidating projects; sanitation, prevention of soil erosion, forestation; reforestation, flood control, rivers and harbors projects.

How many professional engineers know that this program was suggested right in our own profession? How many know that in 1931, one of our best names said:

"The only answer to the depression is a Federal bond issue of 5 billion dollars, to be poured into public and quasi-public works. . . ." "The unemployed engineers of this country should be at once mobilized, at relief wages, to supervise its expenditure, and the labor involved should also be paid at relief wages, well below the normal market rate, so that the programs will be self terminating through the withdrawal of participants as soon as they find normal jobs. . . ."

One of our own leaders suggested to us four years ago that "we could have obtained a patent on WPA." As it is, the country has this program, but unfortunately for us—and perhaps for the program, no proj-

ect can be advanced other than by an existing governmental agency. There is no place in which professional engineers can get into the picture as expert, consulting, or advisory groups. All they can do under the WPA is take individual employment, in exactly the same way that they would take jobs through a public employment agency.

If there were by chance in this country, any authoritative group of professional engineers, it would have paid that group in the past few weeks, paid the profession, and paid the public, had it come out in strong opposition to the WPA procedure. Not that there is anything wrong with the procedure, but the whole job of WPA is an engineering job and nothing else. Without inserting controversial political comment, it is a kind of a tragedy for our profession that an imaginative engineer could not have taken or been given the opportunity of putting through the program of WPA. We should probably then have been in the picture as an engineering body.

The Tennessee Valley Act

Concerns one particular industry, and so far interests a few electrical and civil engineers. Probably the most important provisions are those which take away from the Comptroller General certain powers he had to void agreements of the Tennessee Valley Authority. These matters are of little concern to the average professional engineer.

Probably the most interesting phase in this realm, is the work of the Government in the field of pricing and selling electrical appliances, and engineers should watch the stimulation of this Authority on appliance sales methods. Some contend that the next big development in the power field, is in the sale and financing of new appliances, and the controversies over rates for current are secondary and camouflaging.

The RFC Extension Act

Extends the lending power of the Authority until February 1, 1937. This Corporation has broad powers for making loans to industry. It is the agency which did much to maintain the credit standing of the whole country through the time of the collapse of the banking system. Specifically, mining engineers may use a provision of the Act to secure loans to develop mining, milling, or smelting ores. Engineers might probably also have secured a provision for loans for general consulting work; there does not seem to have been any reason why this should not have been except that the necessity did not occur to the Government itself, and there was no agency in the engineering profession to suggest the principle.

It should always be remembered that this far-reaching and basic act was inaugurated by the past administration.

The AAA Amendment Act

Seeks to bring the farm program within the limits of constitutionality, and to add to its effectiveness in raising farm purchasing power to the level set by Congress.

It is an excellent field for controversy between those who believe in a planned economy and those who do not; an excellent subject for study for professional engineers as to whether there is a law of supply and demand or whether we only think there is. This is not stated in condemnation of the Act and of the AAA principles. Probably our profession does not know enough to condemn or praise, and probably we do not have to. All we need know is that we have legislative bodies which so far can pass economic laws, or restraints on economic laws, without consulting us. If we do not think it can be done, we have the opportunity of developing a mass opinion to say so. If we do not do this, that is our business.

The Farm Research Act

Directs the Secretary of Agriculture to conduct research into the laws and principles of agriculture. It appropriates $8,000,000 for the purpose, to be spent over five years.

Engineering Foundation, at the suggestion of Mr. Hoover when he was President, recommended to the Government the appropriation of 100 million dollars for research work. Under the Roosevelt Administration, the recommendation was renewed. It was not adopted, however. The governmental agencies are getting research money, however, as this Act shows. But the engineering profession has no direction of the work. Some day we may learn that when we make recommendations, we should add an offer to administer appropriations. We might visualize the engineering profession set up in Washington as a FAEC, Federal Advisory Engineering Council, with even more than 100 millions placed at its disposal. But we should have to fight the ramified existing governmental agencies to get it.

The Banking Act

This measure seeks to provide for sound, effective and interrupted operation of the banking system, through amendment of the Federal Reserve Act, reorganization of the Federal Reserve Board, and technical amendments to the banking laws, as well as by making Federal deposit insurance of bank deposits permanent.

As judged by its length in words, and the ramifications of its provisions, as well as by the attention given to it before its passage in the financial section of the press, it is evidently an Act which will ultimately have the significance of the original Federal Reserve Act.

From the point of view of the professional engineer, while the operations of the Federal Reserve Act and of the Federal Reserve Board may not have contributed to the crash of 1929, they do not seem to have been able to prevent it. Nor were this Act and this body apparently able to thwart the closing of the banks in 1933.

It is probably safe to guess therefore that not many bankers know what the new Banking Act is likely to do, and it is also probably safe to say that they hope that the operation of the Act will result in some good.

Again from the engineer's point of view, the general situation in the country seems to be that the credit of the Federal Government is still very good. It seems to a few to be almost too good. Some observers contend that because the credit of the Federal Government stays so good, it is difficult for the status of private credit to improve. This is a subject of great study. Professional engineers, detached individuals without any particular governmental responsibility except as individual citizens, might do well to make the study of the subject of credit a part of engineering economics. The opportunity is wide open for a national advisory body. There are myriads of miniature com-

(*Continued on page* 25)

THE TULANE UNIVERSITY LIBRARY NEW ORLEANS

A SCIENTIFIC MONEY SYSTEM

A TREATISE ON A SUBJECT WHICH IS MANKIND'S GREAT CONCERN

By
GUSTAV LINDENTHAL

(*Continued from August Issue*)

THIRD CONDITION

"The currency notes must be legal tender for all taxes and all public and private debts, to the exclusion of all other kinds of money, whether paper, gold, or silver."

This is necessary to prevent confusion in all fiscal transactions and to maintain the monopoly of money for the Government in the same manner as the Government maintains the sale of postage or revenue stamps as its exclusive privilege. This condition will establish the credit currency as the standard by which the exchange of all other currency, whether coin or paper, will be quoted. There shall be only one legal tender in a country and that shall be its own credit currency, complying with and protected by the six conditions named.

It is an old experience, that with more than one kind of money in circulation the cheapest tender will force the others out of circulation. It would be desirable, although not necessary and hardly permanently attainable, that the dollars of different countries should have the same value. The new dollar unit in the various countries should be established as near as possible at the same purchasing power for food and clothing as in the United States. These commodities are the first essentials of human life everywhere and furnish the readiest comparable values in the open market.

It is no more necessary for a Government to delegate the issuance of money and currency to banks of any kind than would nowadays be the farming out of the collection of taxes (*as in the Middle Ages*) or than is the issuance of postage and revenue stamps. The banks become simple depositories and money offices as regards currency, for which they must account similarly as post offices account for postage stamps. All the complicated and costly money affairs of the Government would be simplified and a large number of office-holders dispensed with.

No profit or privilege should accrue to any one from the issuance of a national credit currency. No guarantee is required from any bank. Political influences would be eliminated, because the bank privilege of manipulating monetized private credit would not exist. But great concentration of actual money in place of credit will be possible as before for great business operations, either domestic or foreign.

Conversion of United States Bonds

The United States has now about 19,000 Million of interest-bearing gold bonds outstanding, on which the yearly interest and amortization is about 1,000 Million Dollars. The Government should gradually buy these bonds at its convenience in the open market and pay for them with neo-dollars. No bondholder should be compelled to sell his bonds. Let him exercise the privilege whether to be paid in gold on maturity or in neo-dollars at the market rate. Gold will be cheap after dethronement.

The Government should invite the state and municipal Government to establish their own banks with capital in neo-dollars and to manage their own deposits from taxes. This would produce a saving of many hundred million dollars in interest expenses over the present practice with public money deposits in banks with private capital. Opposition from the banks must be expected, the source of great profits will not be given up without a struggle.

Compared with it, the historic battle of President Andrew Jackson against the establishment of a monopolistic national bank with private capital will appear to have been a trivial affair.

Profits for Banks

Present banking methods favor expansion of interest paying bank credit against interest free currency. This tendency is shown in the bank figures of 1922 above given. The combined bank capital in 26,800 banks is 4,000 Million Dollars and deposits 33,000 Million, or about 8 times the bank capital.

But all earnings from the combined (4,000 plus 33,000) 37,100 Million go to the shareholders of the 26,800 banks as profit. These were estimated during the prosperity boom at over 2,000 Million Dollars per year, equal to 50% on the bank cash capital.

Assume now the same total capital and deposits loaned out at an average of 1½%, then the earnings would be near 550 Million or 13% on the bank capital of 4,000 Million, which would still leave an ample margin after deducting the much smaller expenses of the banks with the proposed Money System. It would be open to banks to decrease their numbers and to increase their capital (one Million Dollars should be the smallest capital), and become the financial leaders and managers of business operations creating substantial wealth and earning legitimate profits therefrom, which is a quite different thing from charging usurious interest for fictitious money and bank credit loans and foreclosing unprofitable property and getting it at half price.

It is thus seen that the proposed money system creates the feasibility of loans at such low rates of interest as present banks cannot afford.

The necessity of reducing business expenses will bring a change from the costly gold fetish sooner or later. It has assumed too much the nature of a flim-flam game on a large scale. All the nations playing at it are getting into trouble one after the other. The United States will not be spared. Gold redemption is a make-believe like the march of Caesar's endless army across the stage and behind the wings, for which only a few soldiers are needed.

As a result of the proposed money system in other countries, wages and prices would gradually rise to the level in the United States.

In that manner the adoption of the scientific credit currency by a single country would act as the leaven of trade for other countries with which it has commercial relations.

FOURTH CONDITION

"The income from taxes and other sources of the Government issuing the currency notes must not be less than the outgo of the Government expenses. In other words—there must be maintained inviolate a balanced budget."

The old rule that the expenses of Government shall not exceed income and that the yearly budget shall rather show a surplus is of greater importance than ever, when the value of money depends upon this condition. No legislative body or other Government agency should be permitted to disregard or violate it, or to increase or decrease the quantity of money once established per capita.

Government is business on a large scale. If a businessman is known to have an income or liquid wealth larger than his outstanding obligations his notes are good. If his income is smaller than his liabilities his notes go below par. This is the condition of many Governments at the present time, their expenditures are larger than their income from taxation and they then become financial slaves to their bank creditors under a crushing and growing load of interest charges.

Here the question may be asked "Cannot the Government, when in need of money for extraordinary expenditures like those of war or famine simply issue more paper currency additional to the amount determined on the per capita basis?" The answer must be that common honesty forbids doing so, and that it is not necessary.

More dollars would mean diluting the currency as water dilutes milk. The value and purchasing power of the dollar would be depreciated just at a time when war may be destroying part of the national wealth. Each additional dollar would further lessen the value of the old dollar, which is dishonest.

It is not necessary, because the more scientific way for the Government to meet the increased expenditures of an emergency is through immediate increase of taxation plus the sale of Government Bonds or through forced loans. War means sacrifice of life, and property, money should not escape. The banks should accept the bonds as collateral for time loans with proceeds subject to check. This will very largely increase liquid bank accounts and provide more funds as needed. Circulation will thus be accelerated without increase in the amount of currency. The value of the dollar is not diluted thereby, but its purchasing power may appear reduced relative to the rise in prices to cover increased taxation, for the interest on the loans and for amortization of the bonds after the emergency has passed.

But all Government bonds should be non-taxable and bear not exceeding 2% interest. It is nonsense to issue taxable Government bonds at high interest rates and then have the expense of collecting the income tax thereon. Better deduct the tax in advance by reducing the rate of interest. During a war general taxation should be increased at once to meet war expenditures, which include interest on bonds. Amortization should commence immediately after a war. Taxes must be increased as needed to balance the budget at all times in order to maintain the value of the dollar.

During war or other emergencies the value of the dollar need not be diluted as shown. It can be made to circulate several times faster in the manner indicated. That is the scientific and the safest way of financing a war or other great emergency without too great financial waste and with a view to maintaining as far as practicable the stable purchasing power of the dollar.

FIFTH CONDITION

"The credit currency notes shall be redeemable in only one way; that is, by the Government receiving them for taxes and dues and destroying them, if need be."

Since the Government notes are issued for value received, they must be accepted for taxes and dues. Any surplus notes so received to be re-issued in order to maintain the fixed amount of circulation, which sustains the uniformity of the dollar value. No other money—gold, silver or paper— shall be accepted by the Government for taxes and dues. That establishes the legal tender value of the money absolutely and beyond peradventure. The Government must collect taxes, and the amount it may collect is practically without limit. It can, therefore, redeem all its credit currency whenever it wants to. But it will never want to do so, because it must be maintained as money. Good Government should of course be carried on economically, but whether or not, whatever taxes it collects shall be exclusively in its own credit notes. When population or wealth decreases, then a proportionate amount of notes from the surplus shall be destroyed.

The credit currency is as necessary for the existence of the nation as the taxes themselves. There can be no surer redemption method than that through taxation.

Thus it is clear that for balancing trade and commerce a steady and fixed volume of non-hoardable legal tender money will furnish the safest guarantee.

With the present money system the richest Government may not escape during a long depression the depreciation of its currency and the paying of high interest on bonds when these become necessary for the relief of distress and to provide employment. Such relief presents the anomaly that the capitalist must first be provided with a workless income before the worker can obtain work.

The workman reasons—no interest—no money—no jobs—no food. Why is not this money taken from the capitalist by outright confiscation?

Here lurks the danger to Government itself. The

Socialist and Communistic doctrines do not believe in thrift, by which capital is produced that provides jobs for the workers. They denounce profit as unmoral and fail to see that it is the indispensable power driving on to higher levels of civilization. But it is equally true that this power has been terribly abused and that it requires curbing and regulation, which only Government can effect.

There is no doubt that the present world crisis will lead to such regulation in the different countries, also in the U. S., and that it should include the regulation of money.

It will be found that as wealth accumulates, the rate of interest can be much lowered. A rate of 2% is already indicated as a generous return on secure investments. The time for 6-8-10 per cent investment is destined to pass into oblivion with the gold standard, so convenient for usurious manipulation.

For the present it would be wise to follow the policy, that when high interest bonds have to be issued they should not be sold to individuals but *exclusively to savings banks, insurance companies, and associations* for the benefit of the aged and sick who cannot work any longer.

SIXTH CONDITION

"The currency notes shall not be hoardable and to that end shall be issued only for short and renewable terms, but the total amount outstanding at any time must not exceed the fixed amount of Condition Number Two."

Hoarding of money, whether coin or paper, when done on a large scale—as in a panic or in war times—has been a frequent cause of usury and ruinous business depressions. With gold or silver coin and with paper currency redeemable with gold or silver, hoarding is practically unpreventable.

Restriction of circulation of money often brought on willfully by speculative interests, immediately impedes trade and causes business troubles in order to maintain a stable flow of goods, wages, and prices. Money must be kept in circulation to fulfill its true function as a medium of exchange. Experience shows that currency of about 40 dollars per capita is sufficient for this purpose in this country.

Hoarding can be prevented in the following manner:

1. Currency notes for circulation.
2. Currency certificates for deposit in banks.

The currency notes for circulation in suitable denominations would replace present bank notes, silver, certificates and other paper money. Each note to be stamped with the date of issue. If presented at a bank within a specified time it may be exchanged for a new note of equal denomination. Notes presented later than the last date stamped would be charged 5% annual interest for overtime before they are exchanged or renewed. This provision will bring notes promptly back to the banks for deposit or for circulation.

Currency certificates for deposit and large transactions to be in large denominations—500 to 1,000,000 Dollars—to be used as reserves and bank deposits changeable on demand, without charge, into non-hoardable currency notes of smaller denominations. These certificates shall likewise be stamped with date of issue and restamped or renewed, as the case may be, so that their whereabouts shall be known and recorded. They would likewise be subject to interest for overtime.

These large certificates may be compared to gold on deposit. Gold requires storage and is expensive for transportation; currency certificates are inexpensive for storage and transportation. Gold if stolen is lost and may not be recovered; the currency certificates if stolen are not lost because they cannot be used by anyone without instant detection. They are equal to gold for the purpose of money, and without the dangers and inconveniences of gold. Both are of equal usefulness for large credit operations and instant conversion into circulating currency.

Gold can be hidden and no one can compel its use for money purposes. But currency certificates cannot be hidden without detection and their use for money can be compelled through charge of interest for overtime, as stated above.

In this way the fixed total amount of currency, no matter to whom it may belong, can be forced to function and cannot be arbitrarily expanded or contracted to produce either inflation or deflation in peace or in war times.

Currency notes, small or large, straying into foreign countries, will there be without value as money. This will insure their return to the country where they are the sole legal tender.

APPENDIX

A money system can be called scientific only when it can do the following things:—

1. Preserve the stable purchasing power of the money unit (dollar) within close limits at all times.
2. Control and curb automatically excessive speculation in all investments.
3. Prevent automatically severe business depressions and bankruptcies.

The scientific money system (combined with a banking system) outlined and discussed in my thesis, will fulfill all three conditions in contra-distinction to the present so-called gold standard money and banking systems which do not meet them, as proven by the present unparalleled business depression and the closing of several thousand banks in this country.

Gold is only a bait of trade, in the light of common sense a childish device, to impress the credulous. The moment that the much advertised gold redemption (one gold-dollar to cover about 25 paper-dollars) is attempted, the money system based on it starts on the toboggan to bankruptcy and can be saved only by Government credit as we witness now all over the country, through the operations of the Reconstruction Finance Corporation.

The foreign exchange relations of money with other countries can be quite properly based on gold, as stated in my thesis. But it should not control the value of domestic money for internal trade, which is at least ten times greater (in the United States) than the foreign trade.

As the cost of production of all kinds of wealth in all countries is in constant flux and always will be, because it depends, aside from the different efficiencies of labor, on many factors that man cannot control (weather, mineral deposits, political conditions, living conditions, etc.), therefore, a money unit based on a

(*Continued on page* 24)

THE ENGINEERING PROFESSION

CAN IT BE CONTROLLED

Some Practical Reflections

By

WARREN JOHNSON

EVERY once in a while, some engineer is inspired with a desire to develop a control, whereby all the organizations of the profession could be held in line on a purposeful principle or policy.

The inspiration is usually engendered from the analogy of other professions, principally the medical and legal callings, which are each visualized as possessing such a control, and, coincidently the same kind of controls. A statement of these controls will exemplify.

In both the medical and legal professions, a person cannot practice without the authority of law, and this regulation is exclusive. Since it is so, illegal practice is an indictable offense, and a person found guilty is subject to a prison sentence. In these professions, alleged violations of the laws are investigated by the respective professional and voluntary associations, such as the American Medical Association, the American Bar Association, their subdivisions and affiliated organizations.

Those who envision control of the Engineering profession, usually have in mind the application to professional engineering of exactly this principle. They conceive a status wherein all the States enact mandates that practicing professional engineers shall be licensed, and in which the national societies, together with the State and local societies and clubs, shall all cooperate to bring about the restraint from practice of any professional engineer who is not licensed under a State law.

A few recent successes of the National Society of Professional Engineers, in at least modifying the advertisements of non-licensed engineers, has focussed new attention on the possibilities of the control of engineering professional practice. The difficulties are still many, and are mostly due to inertia and indifference on the part of engineers themselves. Nevertheless, part of the blame must be laid at the doors of the engineering societies and their affiliates, as their ambitions to raise the standards of the profession have not always been sincere. This has been partly due to the ever-changing front in these societies. The turnover of officers, directors, and even staff, is very great. More important however is the absence of any control,—due to the lack of vision by practically almost every engineering leader. The professional leaders do not seem to appreciate that the engineering profession and the professional engineer can be controlled in a practical way.

The engineering organizations seem so numerous. Their functions seem so diverse. One specializes in providing membership for this kind of professional engineer, another for that kind of engineer. The functional work of the societies is divided and ramified into a multiplex of committees. These committees hook up with corresponding committees of similar organizations, or with public bodies. On top of these are the boards of direction of the organizations, the administrative committees, the policy committees, the by-laws committees, each interested in advancing the organizations, engaged in spasmodically inventing general expressions of policy for the engineering profession and the professional engineer,—all in a perfectly random way.

While the writer, for many years engaged in promotional work in engineering societies, did not for some time see much hope for controlling the profession and the professional engineer, through the State licensing principle, he has been compelled to observe the recent growth of licensing. He has endeavored to analyze its implications, and to study how the licensing trend in the profession can be utilized to extend controls. In this statement he submits he is in favor of a controlled profession, and he admits this article would not have been written did he not see a way in which this control could be developed.

Before presenting his recommendations, the writer feels it necessary to offer certain comments. The question has frequently been put to him. "I thought you did not believe in State licensing. I thought you had stated publicly that licensing was only necessary for engineers employed in the service of the public. Why the change?" To this he answers: "This statement was made by me some four years ago. Since that time, for reasons not necessary analyzable, the licensing movement has gained a great impetus. Also, it was never a case of *believing* in licensing. It was always a case of *opposing* licensing or *promoting* it. Something must be promoting licensing, as it is advancing rapidly, and so long as this is the case there is no sense in opposing, unless the licensing principle is *subversive*, and this it is not and cannot be."

Accepted that the State licensing principle will advance until it embraces all the States—it is now two-thirds of the way,—it becomes immediately essential to accelerate this advance as rapidly as possible. Acceleration must become greater than it has ever been, as it is reasonable to assume that the remaining third of the States will be the hardest to convince. Further than that, it must be assumed courageously that some of the missing States will not concede unless a practical "coercion" is applied by those who are "managing" the promotion of licensing. The words "coercion" and "managing" are used here illustratively, as of course there is no one person and no agency doing any coercing or managing. But the point is there may have to be. It is just as if, in the medical profession, a license to practice medicine was required in all states but three, and these three could never be won over. The result on practice would be obvious—all doctors, all quacks, disbarred or disqualified from practice in the other 45 states would migrate to the utopia offered by these three. And their antics there would just about nullify the good of the medical professional in the whole country.

Obviously, should such a condition ever have ob-

tained in medicine, the American Medical Association, or some similar agency, could justify its existance entirely, and all its ramified educational and administrative sidelines, if it could within a measurable time "put the quacks in the three rebel states on the spot," by forcing license laws through there. The example is perhaps an extreme one, as we are not yet accustomed to dub unlicensed engineers quacks, and neither have we in the engineering profession any disbarred or unfrocked practitioners. Neither do professional engineers yet migrate round the country looking for "unlicensed states."

Of course, none of these conditions may ever come, but the principle remains that professional engineers and the public have carried state licensing as far as it now is, and there is profit, as it were, for someone now to conceive a quick method of carrying the principle the whole way.

The first and easiest thing to do is to seek out, study, experiment with, seek to remove, *and actually remove,* all obstacles, all counter expressions to the principle, all inertia, all everything except *positive action* in the States where action is pending. And the easiest place to seek these obstacles is right at home; in the home itself. Home here means, first the State and local license promoting Societies, and then the National Society of Professional Engineers.

Probably these societies are for the most part for the principle, but even that must not be taken for granted. The practice must be initiated of asking every member, every candidate for office, every committee man: "The State of ---------- is missing from the list. We must try to bring in this State by such-and-such a date. We must check all your affiliations which would influence this goal. We must check on the campaign in this State, and to do so we must obviously check on you. We are not providing, in our organization, a medium for personal publicity for professional engineers. Neither are we providing a luncheon club, though we may enjoy this too. We have a serious purpose—viz, to get a license law through in this State as quickly as possible, using as large an organization as possible to gain weight and representation before the legislature."

Next in line comes the tackling of the local and national engineering societies. To present the *extreme desideratum the condition must be achieved whereby during the period required to approach totality of the State licensing principle for professional engineers, NONE OF THE NATIONAL ENGINEERING SOCIETIES should make any expression, expound any policy, or even offer any assistance unless the action is requested formally by the National Society of Professional Engineers.*

A tall order, an impossible order, a usurpation of the rights of the national engineering (technical) societies and their members, many will say. An assumption of arrogance in the part of the N.S.P.E., others will say. But wait a minute! What *rights have the national technical societies in the field of State licensing of professional engineers?* Let us examine.

A national engineering (technical) society, has the right to pass a resolution favoring or opposing, offering to cooperate in or declining to cooperate in, the passage of a State licensing law. Such societies are usually incorporated bodies, operating under State membership corporation laws, and though such bodies are nominally limited in function to the education and improvement of their members, there is nothing in their enabling charters, to prevent their participation in lobbying.

As a specific example, there is nothing to prevent, say, the American Institute of Mining and Metallurgical Engineers from passing at a general meeting, a resolution reading:

"RESOLVED that the A.I.M.M.E. does not favor a law licensing professional engineers to practice their profession in the State of Nevada.

"RESOLVED FURTHER, that the A.I.M.M.E. is opposed to the principle of the State licensing of professional engineers."

or, as a second example, there is nothing to prevent the American Institute of Electrical Engineers, say, from passing a resolution reading:

"RESOLVED that the A.I.E.E., in convention assembled, does not oppose the State licensing principle, nor does it favor it, but the Institute will cooperate to give information in States in which a license law is pending."

(These resolutions are of course fictitious, and illustrative only).

Those who know the workings of the national engineering (technical) societies, know how resolutions such as these can be put through with facility. This is not said in criticism—it is simply the statement of a fact, and in describing the facility briefly, the illustration can be broadened slightly to indicate a purpose.

Suppose in Nevada, a chance opportunity presents itself to someone to introduce a bill for licensing professional engineers, and for "helping close the ring of licensing for the whole country." *Anyone* in Nevada interested otherwise, learning of the situation, can start a chain of actions which might conceivably lead up to a resolution of opposition "from the whole A.I.M.M.E.," to be handed to the sponsor of the proposed bill. Such action might well be counter to the wishes of the public and the profession of that state.

Nevada and the A.I.M.M.E., mentioned in this illustration are to be regarded as fictional, but there is such a state and such an institute.

And now the question arises of whether such situations, even though fictional, can be prevented. *They cannot be, but they can be counteracted and neutralized.* The N.S.P.E., for example, can, if it wills, neutralize any action on licensing in any particular state, taken by another national engineering body. In plain words, if the N.S.P.E. decides to lobby for the completion of the State licensing principle in this country, it can with State Society support successfully oppose *any* other lobby having the opposite purpose in view, or interested in stalling the extension of license laws, if it stresses public welfare and arouses public opinion.

It may be surprising to many to learn that though the national engineering (technical) societies and their ramified conglamorates and affiliates are engaged in continuous lobbying (even the advancement of engineering standardization and engineering education is lobbying) this lobbying is put through with "large assumptions born of little justification." Yet results are quite worthwhile.

Does the N.S.P.E. want to use the national engineering societies to foster license laws for professional

(*Continued on page* 21)

ITEMS OF GENERAL INTEREST

NEWS, REPORTS, COMMENTS

State Activities Omitted from this issue because of Summer Recess

Correspondents and readers are invited to submit for publication items of interest to the professional engineer of the country. Such material should be forwarded as quickly as possible in order to keep news up to date.

OFFICERS AND DIRECTORS OF NATIONAL SOCIETY MEET

Nominations for Officers—1936

With the entire Executive Committee and representatives from Connecticut New York, New Jersey, Pennsylvania and Ohio in attendance, the Board of Directors of the National Society met at the National Press Club in Washington, August 24th. Donal L. Chamberlin, President of the American Association of Engineers was present as a guest observer.

Copies of the minutes as recorded by Secretary Conlon have been forwarded to all member societies.

The reports of the Committee on Nominations and the Committee on the Annual Convention are noted here.

The Nominating Committee, composed of Engineers Sheridan, New York; Laylin, Ohio; Weeks, New Jersey; Sacks, Pennsylvania, and Conlon, Connecticut, submitted the following report:

For President, Engr. David B. Steinman, New York.

For Vice-President—Engr. Thomas W. Battin, Pennsylvania.

For Vice-President—Engr. Hugh A. Kelly, New Jersey.

For Treasurer—Engr. Perry Ford, Ohio.

The Board directed the Acting Secretary to prepare the necessary ballots and to have same mailed not later than September 23rd.

The report of Chairman Perry Ford of the Convention Committee indicated that the plans now in the process of execution will produce an occasion unequalled in the annals of the profession. Skeleton details appear elsewhere in this issue. The names of speakers will be announced later as will plans regarding broadcasting and publicity.

The following resolutions were immediately transmitted to the President of the United States:

WHEREAS, it has been indicated in President Roosevelt's Executive Order of May 20th, 1935, that a maximum expenditure of $1,100 per man per year has been set up for each WPA project, and

WHEREAS, there are many types of professional projects of a highly technical character and of permanent value to the community which can only be successfully executed by trained engineering personnel, and the limit of $1,100 per man per year will not provide adequate remuneration for the number of professional men required to properly carry out this type of project,

BE IT RESOLVED, by the Board of Directors of this Society that it be recommended that the limitation of $1,100 per man per year as a fixed sum on all projects be waived to permit of an increased expenditure where the type of project involves the employment of a high percentage of technically trained professional men.

WHEREAS, it has been indicated in President Roosevelt's Executive Order of May 20th, 1935, and Circular No. 1 of June 15, 1935, prescribing relief work regulations, that workers from relief rolls constitute at least 90% of the total number of persons working on a WPA project, and

WHEREAS, the unemployed professional engineer, in spite of extreme financial distress and practical destitution, has been loath to apply for aid through relief rolls, with the result that the names of very few of these unemployed engineers appear on the relief rolls,

BE IT RESOLVED, that it is the opinion of the Board of Directors of this Society that the requirement that 90% of workers on a project come from the relief rolls to be altered to permit the employment of engineers, attorneys, physicians, architects and members of other equally recognized learned professions.

Information recently received suggests a period of transition may shortly be expected with hopeful prospects for engineers.

ACCOUNTANTS ACCEPT ENGINEERS' FORM OF ORGANIZATION

American Institute of Certified Public Accountants Agreed Upon at Conference

Representatives from fifty states and territories recently met at Atlantic City for the purpose of creating a national organization of Certified Public Accountants.

Following the example of the National Society of Professional Engineers the new society is to be composed of state groups and is to be restricted to accountants certified in accordance with the laws of the several states.

Following are excerpts from the conference:

"Resolved: That it is the opinion of the representatives of State societies here assembled that one national accounting organization is to the best interests of the members of the profession.

Resolved: That it is the opinion of the representatives of the State Societies here assembled that the name of the resulting single national organization should be The American Institute of Certified Public Accountants.

"Resolved: That it is our opinion that the membership of The American Society be merged with the membership of the American Institute, and that the members of The American Society be admitted to membership in the resulting single national organization upon certification by the President and Secretary of the Society as to members in good standing.

"Resolved: That after the merger it is our opinion that none but Certified Public Accountants should be admitted to membership in the resulting single national organization.

"Resolved: That the by-laws of the proposed national organization provide for an advisory council to be composed of the presidents of all State Societies of Certified Public Accountants.

"Resolved: That the advisory council be composed of presidents or duly authorized representatives of State societies.

"Resolved: That we recommend that the by-laws of the proposed national organization provide for an advisory council to be composed of the presidents, or duly authorized representatives in case the president may not be eligible or able to serve, of State societies to consider such questions as may be referred to it by the governing body and to initiate and recommend such action on the part of the governing body as may be proper.

"Resolved: That the President appoint a committee to prepare a brief statement of the proceedings of this meeting for presentation to the presidents of State Societies, that they might undertake to secure the approval or disapproval of their respective societies during September if possible, for the guidance of the governing bodies of the two national organizations at the time of their annual meetings.

"Resolved: That it is the sense of the presidents and delegates here assembled that the proposed national accounting organizations should maintain an office in Washington, D. C."

DISTRICT OF COLUMBIA

Organizes Society of Professional Engineers

On September 6th, a score of representative engineers met at the Hotel Willard for the purpose of formulating plans for a District of Columbia Society of Professional Engineers.

Secretary Conlon, of the National Society, addressed the conference which selected an organization committee of five. The committee held its first meeting at the office of the Society on Friday, September 13th, at which time the following decisions were reached:

The name of the organization shall be "The District of Columbia Society of Professional Engineers."

The committee declined the aid of the National Society in defraying incidental organization expenses and voted to apply dues already collected for such purposes.

The dues of the Society shall be seven dollars ($7.00) per year, of which four dollars ($4.00) would be allocated to N.S.P.E.

ON REGISTRATION

By

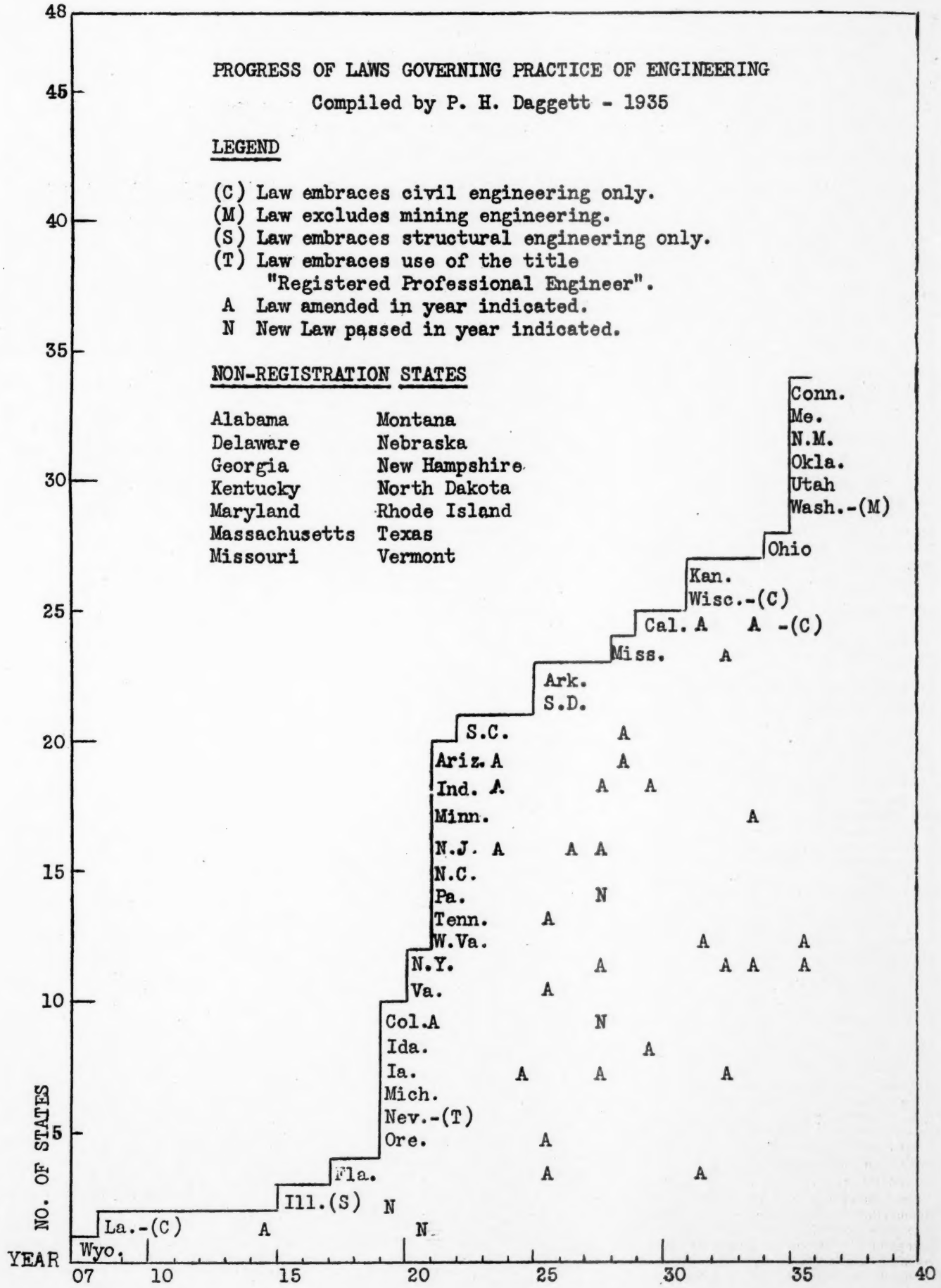
ARTHUR W. BERRESFORD

Past President, A.I.E.E.

In the September issue of Electrical Engineering appears an interesting letter

(*Continued on page* 21)

REGISTRATION IN U. S.



EXAMINATION FOR PROFESSIONAL ENGINEER

CONDUCTED BY THE STATE OF NEW YORK

JUNE 24th, 25th, and 26th

The appended examination questions have been printed at the suggestion of inquirers from several parts of the country.

ENGINEERING MATHEMATICS
MONDAY, JUNE 24, 1935

9.15 a. m. to 12.15 p. m., only

Answer any eight of the following questions but no more. If more than eight questions are answered, only the first eight will be considered. Slide rule and any reference books may be used. Return these questions with your answer papers.

1 Divide the number 26 into three parts, such that the second part is the mean proportional between the first and third parts and the largest part exceeds the smallest by 16.

2 Two points, A and B, are visible from a third point C, but not from each other; the distances AC and BC, and the angle ACB were measured and found to be 1321 feet, 1287 feet and 61°—22′ respectively. Find the distance AB.

3 The height of the frustum of a right cone is $^2/_5$ the height of the entire cone. Compare the volumes of the frustum and the cone.

4 Differentiate $y=\dfrac{2x^4}{a^2-x^2}$

5 Find an angle not greater than 90° that satisfies the equation $3\tan^2 x - 1 = 4\sin^2 x$

6 Expand the following binomial:

$$\left(\frac{x}{2} - 2\right)^5$$

7 If the side of an equilateral triangle is a, find the altitude.

8 What are the equations of a tangent and of a normal to the parabola $y^2=5x$ that pass through the point whose abscissa is 20 and ordinate positive?

9 Three towns, A, B and C, are connected by straight roads. AB is 4 miles, BC 5 miles and AC 7 miles. Find the angle made by the roads AB and BC.

10 Find the equation of the straight line parallel to $2x + 3y + 6 = 0$ and passing through the point (5, 7).

11 Evaluate the definite integral

$$\int_0 (ax^2 - x^3)\,dx$$

12 Solve the equation $332^x=5.17$

APPLIED SCIENCES
Monday, June 24, 1935
1.15 to 4.15 p. m., only

Answer any eight of the following questions but no more. If more than eight questions are answered, only the first eight will be considered. Slide rule and any reference books may be used. Return these questions with your answer papers.

1 An automobile is going 30 miles per hour on a level pavement. If the brakes are applied suddenly, locking the wheels, in what distance will the automobile come to rest? Assume a coefficient of friction of 60% between the tires and the pavement.

2 A steel plate one inch thick is floating in mercury. How much of the plate will be above the surface? Steel weighs 490 pounds per cubic foot and mercury 849 pounds per cubic foot.

3 A bullet is fired into a block of wood. Itemize the various ways in which the energy in the powder is dissipated.

4 A shunt motor is connected directly to a 110-volt line. The field has a resistance of 200 ohms and the armature has a resistance of 2 ohms. How much current is the motor taking if it is turning fast enough to develop a counter e.m.f. of 100 volts?

5 Water is to be pumped through a three-inch pipe, 600 feet long, at the rate of 200 gallons per minute. The point of discharge is 50 feet higher than the source, and the frictional loss of head in the pipe is 12 feet per 100 feet of pipe. How much power is required if the pump is assumed to be 70% efficient?

6 What are the advantages and disadvantages of hydrogen and helium for use as a lifting gas in airships?

7 Describe briefly the factors causing the disintegration and decomposition of rocks.

8 In filtering a water supply through a sand filter, what effects may be expected with regard to suspended matter, color and bacteria?

9 A ladder 16 feet long leans against a frictionless vertical wall. The foot of the ladder is 4 feet from the wall. A 150-pound weight is suspended from the center of the ladder. Draw a diagram showing the forces that keep the ladder in equilibrium.

10 A motorboat which has a speed of 9 miles per hour leaves one side of a mile-wide river for a point directly opposite. If the current is 6 miles per hour, how long should the trip take?

11 A screw jack has a pitch of ½ inch. What load can be lifted by a 50-pound push on a two-foot lever? Neglect friction.

12 Oxygen weighs 0.0892 pound per cubic foot at 32° F. and atmospheric pressure of 14.7 pounds per square inch. If a tank with a volume of 3 cubic feet shows a gage pressure of 80 pounds per square inch at a temperature of 90° F., how many pounds of oxygen does the tank contain?

STRUCTURAL PLANNING AND DESIGN
Tuesday, June 25, 1935
9.15 a. m. to 12.15 p. m., only

Answer any eight of the following questions but no more. If more than eight questions are answered, only the first eight will be considered. Slide rule and any reference books may be used. Return these questions with your answer papers.

1 A beam 24 feet in length is on a simple span of 20 feet with an overhang of 4 feet. A concentrated load of 10,000 pounds is at the end of the overhang and another concentrated load of 20,000 pounds is at the center of the span. Draw the shear and moment diagrams.

2 Choose a plate-girder section with a 60-inch web to resist a moment of 40,000,000 inch-pounds.

3 Sketch a layout for the ground floor of a two-story one-family home, providing a living room, dining room, sun porch, kitchen, pantry, stairways, etc. Assume the home to be square in shape.

4 Describe the tremie method of placing concrete under water.

5 A group of nine rivets, consisting of three rows of three rivets each and forming a square with three-inch spacing in each direction, is subjected to a moment of 100,000 inch-pounds. What is the shear in the outermost rivet?

6 A plank 8 inches wide by ¾ inch thick is to carry 150 pounds per linear foot when laid flat. What simple span may be used if the deflection must be limited to ½ inch? (E is 1,500,000 pounds per square inch.)

7 What precautions must be taken when placing concrete in (*a*) hot, dry weather, (*b*) freezing weather?

8 A rectangular footing 6 feet wide by 20 feet long carries two columns 7 feet center to center. One column, carrying a load of 200,000 pounds, is 4 feet from the edge. The other column carries 500,000 pounds. What are the maximum and minimum unit pressures under the footing for these loads?

9 A compression member 20 feet long consists of two 12-inch channels at 35 pounds, 14 inches back to back, flanges turned out, and a single cover plate 22 inches by ½ inch. What is the safe load according to the formula

$$16{,}000 - 70\,\frac{l}{r} = ?$$

10 A reinforced concrete beam 12 inches wide and 16 inches effective depth is on a simple span of 6 feet and carries a concentrated load of 12,000 pounds at each third point. Design the longitudinal steel, allowing 650 pounds per square inch in the concrete and 18,000 in the steel. [$n = 15$]

11 Calculate the spacing of stirrups ¼ inch in diameter for the beam described in question 10, allowing a unit shear of 40 pounds per square inch in plain concrete.

12 What are the purposes of stiffeners on plate girders? What factors control their spacing?

ELEMENTS OF ELECTRICAL AND MACHINE DESIGN

Tuesday, June 25, 1935
1.15 to 4.15 p. m., only

Answer any eight of the following questions but no more. If more than eight questions are answered, only the first eight will be considered. Slide rule and any reference books may be used. Return these questions with your answer papers. All work in the solution of problems must be submitted.

1 A double-acting steam engine having a stroke of 6 inches and a piston-rod diameter of 1½ inches develops 14 horsepower at a speed of 420 rpm. Assuming a mean effective pressure of 60 pounds per square inch, calculate the diameter of the piston.

2 Compute the second-gear ratio in the transmission of an automobile running 25 miles per hour with a tractive effort of 400 pounds. The rear wheels are 28 inches in diameter and the differential-gear ratio is 4.5. The motor makes 2160 rpm. Also compute the horsepower required to be developed by the motor if the ratio of rear wheel to motor horsepower is 80%.

3 Calculate the length of an open belt running on pulleys that are 10 inches and 20 inches in diameter with 6 feet between centers. The belt thickness is 0.2 inch.

4 *a* Why is it desirable to have the teeth of two gears prime to each other?

b The value of a gear train is exactly 60. The maximum allowable ratio is 5, with no gear having more than 100 or less than 20 teeth. Calculate a suitable gear train with the mating gears prime to each other.

5 *a* Draw a diagram of a four-cycle gas engine and mark on it the events of the cycle, including the opening and closing of the intake and exhaust valves.

b Calculate the thermal efficiency of a four-cycle gas engine consuming 25 cubic feet of gas per brake horsepower per hour, the gas having a heating value of 540 Btu per cubic foot.

6 A blower delivers 3000 cubic feet of air per minute against a total head of 2 inches of water. Calculate the horsepower imparted to the air.

7 What horsepower is being transmitted by a steel shaft when the torsional moment is 14,000 pound-inches and the speed is 1000 rpm?

8 A particular galvanometer produces a deflection of one division on its scale when 2.6 microvolts are impressed upon it. The resistance of the instrument is 56 ohms. What deflection will the galvanometer produce when it is connected in series with a dry cell having an e.m.f. of 1.5 volts and a standard megohm resistance?

9 Assuming the same amount of power to be transmitted over lines of the same length with the same losses, state which of the following d.-c. systems of electrical distribution is the cheaper: 120-volt, two-wire or 240-120-volt, three-wire. Determine the relative costs of the copper needed for these systems.

10 Explain and illustrate *two* methods of measuring the resistance of an electrical device.

11 Power is to be transmitted from Boulder Dam to the Pacific Coast over three-phase lines with 287,000 volts between conductors. What current will flow in each conductor when 120,000 kva are being transmitted? What power will be delivered when the load has a power factor of 90%.

12 *a* Two condensers of 6-mf. and 8 mf. capacitance are connected in parallel and this combination is connected in series with a third condenser of 4-mf. capacitance, across a 115-volt, direct-current supply circuit. Find the charge of each condenser and the voltage across each.

b A certain dynamo field coil has an inductance of 2.3 henries when carrying a current of 1.31 amperes. Determine how much energy resides in the magnetic field about this coil.

13 Two dry cells, each having an e.m.f. of 1.5 volts and an internal resistance of 0.6 ohm, are to be connected in such a manner as to supply as large a current as possible to an external circuit. Should the cells be connected in series or in parallel (*a*) if the external circuit has a resistance of 0.5 ohm, (b) if the external circuit has a resistance of 5.0 ohms?

14 A 200-kva transformer designed to step voltage up from 2200 to 16,500 volts has 790 turns on its primary winding. Find the number of secondary turns and also the primary and secondary currents when the transformer is fully loaded. Explain why the input to a transformer automatically adjusts itself to the load taken from the secondary winding.

ENGINEERING ECONOMICS AND PRACTICE

(Administration)

Wednesday, June 26, 1935
9.15 a. m. to 12.15 p. m., only

Answer any eight of the following questions but no more. If more than eight questions are answered, only the first eight will be considered. Slide rule and any reference books may be used. Return these questions with your answer papers.

1 Define *five* of the following: proposal advertisement, lump sum contract, cost-plus contract, unit-price contract, proposal, surety bond, specifications, extra work, retained percentage.

2 What is a corporation? How is it organized, established, managed and terminated? What advantages does it have over a partnership?

3 In developing an ore deposit, two methods of mining are available. One will recover 80 tons for every 100 tons in the deposit and will cost $2.10 per ton recovered. The other will recover 88 tons for every 100 tons and will cost $2.30 per ton recovered. What is the break-even point in value of the recovered ore below which the low recovery method should be used and above which the high recovery method should be used?

4 A city requires 2,000,000 kilowatt-hours of electric energy per year for various municipal purposes. It can purchase this energy from a power company for 1.3 cents per kilowatt-hour. The city may build its own power plant for $120,000. Annual operation and maintenance costs are estimated at $15,000. Depreciation is estimated at 6% and insurance at 1%. If the city can borrow money at 4%, will it be a good investment to build the power plant? Show calculations.

5 *a* What factors influence the decision as to the economical vacuum to be maintained at the condenser serving a steam turbine?

b What factors determine the economical thickness of heat-insulating covering for a long steam line?

6 A three-wire, 220-volt system, with a neutral wire one half the size of the line wires, is often used. How does the copper economy of such a system compare with that of a two-wire, 110-volt system delivering the same amount of power?

7-8 It is proposed to place a cable on an existing pole line along the shore of a lake in order to connect two points on opposite sides of the lake. Determine whether it would be more economical to place a submarine cable across the lake, assuming the following data:

	Land Route	Submarine Route
Length	10 miles	5 miles
First cost of cable per mile	$10,000	$18,000
Annual maintenance per mile	$200	$800
Interest	7%	7%
Taxes	2%	2%
Life	15 years	15 years
Net salvage value per mile	$3000	$3000
Factor to convert future worth to annuity, 15 years, 7%	0.0398	0.0398

Show your calculations.

9 An electric household refrigerator is equipped with a 1/6-horse-power motor which operates 30% of the time. The efficiency of the motor is 50%. What is the energy cost to operate the refrigerator 30 days at 3 cents per kilowatt-hour?

10 There are at least seven depreciation methods in common use, as follows: straight line, reducing balance, revaluation, work hours or production, annuity, sinking fund, dollar years.

a What is the underlying purpose of *any* method of writing off depreciation?

b Which of the seven methods given above accomplish this purpose most effectively? Give reasons for your answer.

11-12 Discuss briefly and concisely the propriety of a professional engineer's doing the following:

a Participating in competitions for the adoption of plans according to merit and/or for prizes.

b Attempting to secure engagements by reducing his usual charges for professional services after being informed of the charges named by a competitor.

c Requiring bidders, contractors or subcontractors to furnish gratuitously general, structural and mechanical plans, details and specifications needed for bidders or contractors.

d Asking for alternative estimates, secondary estimates and allowances when asking for bids.

CIVIL ENGINEERING

Wednesday, June 26, 1935
1.15 to 4.15 p. m., only

Answer any eight of the following questions but no more. If more than eight questions are answered, only the first eight will be considered. Slide rule and any reference books may be used. Return these questions with your answer papers.

1-2 *a* Describe briefly and concisely the purposes of sewage treatment.

b Explain the construction, use and operation of any *two* of the following: settling tank, sludge-digestion tank, sprinkling filter, sand filter, chlorine treatment.

3 A concrete dam is 45 feet high, 5 feet wide at the top and 24 feet wide at the bottom. The back face (water side) of the dam is vertical and the front face is inclined. Fresh water stands behind this dam to an elevation of 1 foot below the top. Is the dam safe against sliding? Is it safe against overturning? Assume a reasonable value for the unit weight of concrete. Show all calculations.

4 A city with a population of 80,000 is obliged to increase its water supply. State briefly and concisely what data will be essential in planning the proposed work, and how the data should be obtained.

5 State concisely *in order of weight* the several factors that control in major degree the width, alignment and grade of a first-class improved highway.

6 The usual formulas for determining the height and internal diameter for a power-plant chimney permit a nearly independent choice of one of these dimensions, after which the other is found directly. State and discuss the design that will give the most economical proportions with the greatest efficiency.

7-8 *a* Discuss briefly and concisely the necessity for head-water control for dams.

b Describe the construction, installation and operation of each of *two* of the following: temporary flashboards, Taintor gate, butterfly valve, siphon spillway.

9 State the purpose of stiffening trusses in connection with a suspension bridge and discuss briefly and concisely *two* methods of their use or attachment to the bridge.

10-11 Write a precise, definite and workable specification for the item Highway Foundation Course—Field or Quarry Stone under the following headings: Work, Drainage, Material and placing, Measurement and payment.

12 For what capacity in c. f. s. should the main sewer of a city of 30,000 population be designed, the water consumption being 90 gallons per head each day and the sewer assumed to be flowing half full?

ELECTRICAL ENGINEERING

Wednesday, June 26, 1935

1.15 to 4.15 p. m., only

Answer any eight of the following questions but no more. If more than eight questions are answered, only the first eight will be considered. Slide rule and any reference books may be used. Return these questions with your answer papers.

1 *a* Explain the important features of an a.-c. signal system for an electric railroad.

b What is the purpose of a track transformer and how does it accomplish this purpose?

2 Name and describe briefly *three* methods of starting three-phase induction motors.

3 How much would it cost to heat electrically the water for a pool 40 feet x 20 feet with the water 6 feet deep? The cost of electrical energy is 1.2 cents per kilowatt-hour. The water is supplied at 40° F. and is to be heated to 68° F. Assume the heat losses to be 25%.

4 *a* Why are alkaline storage batteries never used to operate the starting motors of gasoline motor cars?

b Draw the circuit of the electrical system on a modern eight-cylinder pleasure automobile. Name and describe briefly the operation of each major part.

5 Explain why it is more advantageous to control the operation of a thyraton tube by shifting the phase of the grid voltage than by varying the magnitude of that voltage.

6 *a* Explain with the aid of a diagram what happens when the field excitation of a shunt rotary converter is changed.

b How do such changes affect the d.-c. voltage?

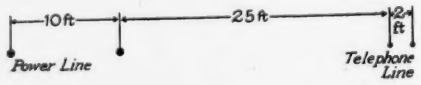
c How may a shunt rotary converter be compounded without altering its structure or windings?

7 Explain what is meant by the term *degeneration* when used in conjunction with a self-biased, class-A amplifier. Show how the degeneration may be reduced economically to a minimum.

8 Explain in detail how to start either a rotary converter from the a.-c. side or a mercury vapor rectifier (size 500 kilowatts or larger). In either case explain each step fully.

9 A T network has series arms of 50 ohms each and the shunt arm is 5000 ohms. How may this network be termi nated in order to simulate an infinite line and what would be the attenuation of this T network in decibels?

10 A 60-cycle power line carrying 100 amperes is parallel to a telephone line, as indicated below. Calculate the induced voltage per mile in the telephone line.



11 Explain how the torque and speed characteristics of a d.-c. shunt motor may be derived from the no-load saturation curve.

12 Describe in detail the engineering aspects of a project you have carried out.

MECHANICAL ENGINEERING

Wednesday, June 26, 1935

1.15 to 4.15 p. m., only

Answer any eight of the following questions but no more. If more than eight questions are answered, only the first eight will be considered. Slide rule and any reference books may be used. Return these questions with your answer papers.

1 An inert gas having the characteristics of air is to be used to empty a tank of alcohol, specific gravity 0.82. The pipe line from the tank discharges to atmosphere 30 feet above the liquid level in the tank. Frictional resistance of the discharge line is equivalent to 10 feet of alcohol. Compute the amount in pounds of gas required to discharge 7,000 pounds of alcohol. Assume gas temperature of 70° F. in the tank.

2 What is the diameter of the orifice required to discharge at the rate of 20 gallons per minute from a water main at 100 pounds pressure? Discharge is to atmosphere.

3 Illustrate by sketch the arrangement of the principal apparatus units in *one* of the following refrigeration cycles: steam jet vacuum, ammonia compression, ammonia absorption. Describe briefly the principle of operation of the cycle sketched.

4 A throttling calorimeter sampling steam at 140 pounds per square inch absolute shows a pressure of 17 pounds per square inch absolute and a temperature of 258° F. Determine the quality of the steam sampled.

5 A balancing weight of 20 pounds is attached to an arm of a flywheel. The weight is 24 inches from the center of the shaft and rotates at 400 rpm. What is the value of the maximum force entering into the design of the fastening of the weight?

6 A pulley 48 inches in diameter with a rim section of 4 square inches rotates at 500 rpm. The rim is of cast iron weighing 450 pounds per cubic foot and having an ultimate tensile strength of 20,000 pounds per square inch. Investigate the hoop tension in the rim, neglecting the effect of the spokes. What is the factor of safety against bursting of the rim?

7 Determine the maximum section modulus required in the frame of a "C" clamp to withstand a pressure of 2000 pounds between the jaws of the clamp. Assume 14 inches from the point of application of pressure to the neutral axis of the section and use 6000 pounds per square inch maximum safe stress of frame material.

8 A source of hot water in a tank at atmospheric pressure, 250 feet elevation, is to be connected to a process tank, which is under controlled pressure of 10 pounds per square inch at 175 feet elevation, to supply by gravity 2500 gallons in a period of 20 minutes. In the 500-foot pipe line connection are eight 90° elbows, two 45° elbows and one globe valve. What size line is required?

9 A test of an oil-fired boiler indicated 12.77 pounds of water evaporated per pound of oil. The boiler pressure was 200 pounds per square inch absolute, superheat was 87° F., feed water temperature 93° F. and boiler and furnace efficiency 82.8%. What was the calorific value of the oil?

10 It is proposed to substitute formed sheet metal for aluminum rod in the manufacture of a small specialty item. The difference in raw material cost is $1.50 per 1000 pieces and an average production of 5,000,000 pieces is expected for a number of years. Special equipment to form the sheet-metal item is quoted at $10,000. The special equipment now machining the aluminum item has a book value of $8000 and would be rendered obsolete with the adoption of the formed sheet-metal item. Summarize the economics of the proposition, making assumptions on other phases of the problem that occur to you. What would be your recommendation as to the proposal?

11 A reciprocating double-acting steam pump 6″ x 6″ x 8″ with a piston rod ⅞″ in diameter operates at 130 single strokes per minute. In a test run of 5 minutes duration this pump discharged water into a tank of 4′—0″ inside diameter and raised the level in the tank 4′—3″. What is the volumetric efficiency of the pump?

12 Mentioning the machine tools used, outline a sequence of operations for machining a well-finished three-step cone

pulley with diameters of steps about 12 inches, 10 inches and 8 inches.

MATHEMATICS

Thursday, June 27, 1935

9.15 a. m. to 12.15 p. m., only

Answer any eight of the following questions but no more. If more than eight questions are answered, only the first eight will be considered. Slide rule and any reference books may be used. Return these questions with your answer papers.

1 Two mountains, *A* and *B*, are 9 miles and 13 miles respectively from a town *C;* the angle *ACB* is 71°—36′. Find the distance between the mountains.

2 Find the equation of the straight line passing through the two points (—1, 2) and (3, —2).

3 Find the area of an equilateral triangle if one side is 8 feet.

4 The frustum of a regular pyramid 6 feet high has for bases squares 5 feet and 8 feet on a side respectively. Find the height of an equivalent regular pyramid whose base is a square 12 feet on a side.

5 Solve the following system of equations:

$$x^2 + y^2 = 50$$
$$xy = -7$$

6 Solve the following equation:

$31^x = 23$

7 Given sin $x = 3/5$, sin $y = 5/13$, and x and y acute; find sin $(x + y)$ and sin $(x - y)$.

8 Expand the binomial $(c + d)^6$

9-10 In the spheric triangle *ABC*, given side a = 81°—10′, side b = 60°—20′ and side c = 112°—25′; find angles *A*, *B* and *C*.

11 Write the equation of a circle whose center is the point (2, 3) and whose diameter equals 10.

12 Express the following angles in degrees not exceeding 360°:

$\sin^{-1}(\frac{1}{2}\sqrt{2})$; $\tan^{-1}(-1)$; $\sin^{-1}(-\frac{1}{2})$; $\cos^{-1}(\frac{1}{2})$; $\cos^{-1}(1)$.

LAND SURVEYING

Thursday, June 27, 1935

1.15 to 4.15 p. m., only

Answer any eight of the following questions but no more. If more than eight questions are answered, only the first eight will be considered. Slide rule and any reference books may be used. Return these questions with your answer papers.

1-2 Given the following survey notes:

Station	Bearing	Distance in Chains
1	N. 20°—00′ E.	4.62½
2	N. 73°—00′ E.	4.16½
3	S. 45°—15′ E.	6.18½
4	S. 38°—30′ W.	8.00
5		

Determine the bearing and distance of the course that will balance the survey.

3 Define (*a*) magnetic declination, (*b*) agonic line, (*c*) isogonic lines, (*d*) order of calls, (*e*) Gunter's chain.

4 A certain surveying instrument is constructed on an optical principle that may be stated geometrically as follows: If the exterior angle of a triangle is bisected and also one of the interior opposite angles, and the bisecting lines produced until they meet, the angle so formed will be half the other interior opposite angle.

Name the instrument and show how the principle given above applies to its operation.

5 "A boundary line having once been authoritatively—though inaccurately or even erroneously—fixed in position on the ground, the true purpose of a resurvey is to reproduce that location; not to 'correct' or otherwise change it."

Is a land surveyor bound by the above in its entirety? Give reasons for your answer.

6-7 A triangular lot containing 40 acres has a spring located in one of its corners. It is required to divide the lot into three parts having the ratio of the numbers 2, 3 and 5 in such a manner that stock in all three of the lots may have access to the spring. The shortest distance from the spring to the opposite side of the lot is 1600 feet. Make the division of the lot and prove your work.

8 Define a meander line and discuss its function as a property line.

9 An original subdivision map shows a city block to contain ten 50-foot lots facing on Blank Street, these lots being numbered from 61 to 70, inclusive. Lots 65, 66 and 70 are sold with a frontage of 50 feet each, the remainder of the lots still being in the ownership of the party who made the subdivision. Subsequently, the owner of lot 66 employs a land surveyor to make a resurvey of the lots facing on Blank Street. The resurvey discloses that the frontage of the block on Blank Street is 502.68 feet.

Discuss what may be done in this situation, stating especially the authority of the land surveyor with regard to the distribution of the surplus.

10-11 The map of a proposed reservoir site has contours at five-foot intervals. The following data are taken from the map:

Elevation of water surface	*Area of water surface in square feet*	
760	4,600,000	Reservoir full
755	4,000,000	
750	3,800,000	
745	3,000,000	
740	1,000,000	
735	100,000	
730	10,000	Normal stream surface

Find the storage capacity of the proposed reservoir in cubic feet.

12 The slope-stake fractions for two stations 50 feet apart are given in the following table:

Station	*L.*	*C.*	*R.*
86 + 00	F. 6. 0	F. 3. 8	F. 2. 0
	37	0	31
86 + 50	F. 8. 0	F. 4. 0	F. 6. 0
	40	0	37

The roadbed is 28 feet wide and the side slopes are 1 on 1½. Find the volume in cubic yards of the earthwork filled between the stations given.

THE ENGINEERING PROFESSION—CAN IT BE CONTROLLED?

(*Continued from page* 15)

engineers in states that have none. It certainly desires to prevent their opposition. Can this be done? Undoubtedly. It requires but a slight knowledge of politics to envision an opportunity to change the controlling influences in these societies. Perhaps this is an opportune time to seek a reorganization of certain National Societies. Minority control is passing nationally and professionally. A president of one of the national technical societies once said to the writer: "The ability to perceive the obvious is a rare gift." It is obvious that the engineering profession can be controlled, by safeguarding it for public service. The thing to decide upon is what control is proper. At the present moment, it would seem desirable to so control it to complete the state-licensing principle for the rest of the country.

ON REGISTRATION

(*Continued from page* 16)

upon a recent address delivered by Dr. D. B. Steinman.

Excerpts, together with an editorial note, follow:

"To the Editor:

No one who heard Dr. D. B. Steinman's address on "Registration of Engineers" presented at the education session of the Institute's 1935 summer convention (and published in full in Electrical Engineering for August, 1935, pages 876-81) can escape one conclusion, viz.: the utter futility of debate as to whether or not registration should be. The fact that 31 states have accepted as essential the protection of the public against incompetence and fraud, and to that end have enacted measures providing for registration, is basic so far as registration per se is concerned.

There may be profit, however, in analyzing this legislation to determine its probable effectiveness and the extent and manner in which it affects the profession. If this analysis should make evident that in some particulars its effect on the profession is adverse, and if, without interfering with the stated purpose of the legislation, these factors can be modified, it would seem desirable to determine the procedure best suited to the obtaining of such modification.

Certain characteristics are essential to the success of regulatory legislation of this type. Primarily, it must meet a public need of sufficient importance to induce active enforcement. Secondarily, it must be so drawn as to interfere in the minimum degree with the reasonable operations of those whom it regulates.

If its provisions extend beyond what is necessary to the public need, or if it commands the support of only a fraction of those whom it affects, its modification or ultimate abandonment confidently may be predicted.

Dr. Steinman, an ardent advocate of registration, would have us believe that the very future of the profession lies in the extension and enforcement of such enactment and that only therethrough can the standing and standards of the profession be established and maintained. If he is right the question is one of major importance.

Present Extent of Registration

It is perhaps fortunate that the procedure has been in effect sufficiently widely to permit the gathering of some facts as to the extent to which the profession has arrayed itself under the legislation, whether voluntary or by enforcement.

In November, 1934, American Engineering Council analyzed the 1930 census. 226,000 listed themselves as engineers. 214,000 or 95 per cent, were in the fields of civil, mechanical and electrical engineering; 102,000 in the first and 112,000 in the other 2. The paper states that 85 per cent of the engineer population

(or 192,000) are located in the 31 enacting states. It gives the number registered as 45,000, only 24 per cent of those affected.

The census recorded 44,400, or 44 per cent, of the civil engineers as exercising the relation in which the public needs to be protected, and 29,200, or 26 per cent, of the mechanical and electrical engineers. Of the total, 73,600, about 34 per cent, are in this relation. The total registration, therefore, is only 73 per cent of those registrable and listed as offering their services for hire or in public employment. Actually the fraction is less, since it is known that the registration includes many in private relation.

It would not appear from the above that registration has been adopted enthusiastically by the profession as a whole, nor even by those of the profession who are in that public relation whose control is the purpose of the legislation.

Equally, it would not appear that any measures of enforcement adopted had been outstandingly effective. For instance, the paper cites 348 violations—varying in character—as having received determinative consideration and of these 322 in the single state of New York. Undoubtedly there were more, but compared with the numbers involved almost any reasonable figure would be a negligible fraction.

Some Provisions of the "Model Law"

Obviously, there must be reason for this attitude. May it not be found in the probable effect of the legislation on the 66 per cent of the profession who are in private employment, as distinguished from the 34 per cent who occupy a public relation? Examination of the "model law" may provide some light.

Provisions which deny to qualified engineers the right to use the title of engineer in transactions which in no substantial degree affect the public interest, will surely not command the support of the individuals concerned. Yet these are the underlying bases of the "model law" and of much of the legislation.

Provisions that would compel the licensing of every member of the engineering staff of a corporation, irrespective of actual need, will surely not command the support of either the engineers involved or of the corporation. Yet this procedure is advocated.

The legislation to be practical must command extended respect and support. It must accomplish the actual need and attempt no more. That actual need is the protection of the public against incompetence and fraud. Whatever advantage the profession may gain must be incidental to this purpose.

That advantage will largely accrue to those members of the profession who offer their services to the public on a fee basis, or those in public employment: federal, state, and municipal.

The advantage to those in private employment is at least problematical. Registration will not increase their compensation. This will be based upon no formal standards, however authoritatively adopted, but on the employers' intimate knowledge and estimate of capability and desirability. The standards can take no cognizance of qualifications other than engineering per se. They are necessarily confined to the minimum qualification for the title. In fact, such men are actually handicapped. The effect of the legislation (using the "model law" to illustrate) is to forbid use of the title "engineer" to any unregistered or unlicensed person; this, whether or not he has public contact or responsibility and even though an acknowledged leader in the profession.

An engineer, formally "certified into the profession" under procedure now contemplated by the Engineers' Council for Professional Development (E.C.P.D.) would risk fine and imprisonment by unlicensed use of the title. Such a privately employed "certified" engineer could not use the title in contact or correspondence with his employer's customers, even though they are fully satisfied at his competence. And he must be licensed not merely in his own state but in that of the customer. A traveling engineer must be licensed in each state he visits. State reciprocity is hoped for but not achieved. A research engineer whose work is wholly within walls must be licensed. There is no differentiation between those offering their services to the public for hire and those who have no public function. The unwarranted cost and the handicaps involved are obvious.

In this respect the legislation differs from that of other professions. In law and in medicine it is directed to persons engaged in those occupations for hire and who offer their services to the public.

Fees and Costs of Registration

As to fees: The paper states that fees for the original registration certificate vary from $5 to $25. Figures given for 26 states in an analysis made by Western Society of Engineers indicate 16 states as requiring $25, 3 states $20 and 7 states $15. Of the 6 of the above 26 states which include the major engineering population, 4 require $25, 1—$20 and 1—$15. The "model law" suggests $25.

A fair average would probably be $20. This also is indicated by a suggestion of state acceptance of a $10 fee when an additional $10 fee has been paid to a central examining agency.

The paper gives renewal fees correctly in substance as ranging from $1 to $5. From the same analysis it appears that 1 state requires $10; 12—$5; 2—$3; 2—$2.50; 4—$2.00; and 5—$1. Five of these $1 states are included in the 6 with major engineering population; the sixth requires $5. A fair average might be of the order of $3.

The paper speaks of the cost as small. Is it so small? Assuming the above figures and a final registration of only ½ of the 226,000 recorded in the 1930 census, the states will collect from the profession $2,260,000 for initial fees and $339,000 annually for renewals. And this covers only licensing in the registrant's home state. The amounts will be increased by the multiple licensing essential to many.

But fees alone may not measure the total cost. The paper expresses its belief that the profession needs to "make its influence felt in legislative councils." This can be done only by country-wide organization, if undertaken systematically, and funds will be required. Furthermore, there is no evidence that the present enforcement measures are effective, and more drastic ones may well be instituted. If they are employed, fees will surely not diminish.

The paper expresses the belief that in time legislators will be educated to appreciate that at least half the total cost of registration should be contributed by the state, since the law is primarily for the protection of the public. Is this not, perhaps, slightly too optimistic?

Is there not also perhaps too much of optimism in anticipating any general acceptance of that provision of the "model law" (section 9) requiring that all funds derived from registration shall be isolated and used solely to advance the purposes of the law? This is contrary to the fiscal policy of some states and the paper indicates none in which it is in effect. On the contrary, New York made a profit of $300,000, Colorado established an engineering reference library from surplus, and Oregon's attorney-general approved an advertising campaign.

As the paper states, the fees are not intended as a source of revenue for the states, but so long as legislators are human this factor will probably not be absent.

State Boards of Registration

As to state boards of registration: The "model law" (section 3) provides most admirably for appointment by the governor from nominations made by representative engineering societies. But these positions carry compensation. Clerical and other assistance must be hired and expense incurred and reimbursed. Is one cynical in believing that there will be reluctance on the part of the practical politician in incorporating the provision? Turn then to the record.

But 2 states—Louisiana and Wisconsin—require nomination by engineering societies. Fifteen states leave appointment with the governor with provisions as to minimum age, registration, length of practice and diversification. Five add to these provisions only the requirement of membership in good standing in a recognized engineering society. Three leave appointment to state agencies other than the governor and one provides no method of appointment. Incidentally, there is no definition of "recognized engineering society."

Whatever may be the intent, is there such probability of the maintenance of a plane of service and ideals by boards so appointed as to warrant the transfer to them of the duty of establishing and enhancing the standards and the dignity of the profession?

Procedures Open to Engineers

Dr. Steinman may be right in saying that registration is the only means whereby legal force and sanction may be applied to certain problems of the profession, but is he right in implying that only therethrough can the dignity of the profession be maintained and the public impressed with the fact that engineering is a learned profession?

Cannot the profession, by procedure of its own, evolve the minimum standards which are in its opinion necessary to the title of engineer, and can it not devise means for according that title to those who meet those standards and withholding it from those who do not?

Such standards would be prepared with registration constantly in view and probably cooperatively with the designated authorities. Standards so prepared would be almost automatically accepted and would be a major contribution to uniformity. Equally, they would be permanently without the field of politics.

When accorded the title of engineer should not the recipient (save when he offers his services to the puublic for hire) be left free to determine for himself the desirability of registration?

If this is the desirable condition, changes must be induced in much existing enactment. The first step in such a procedure would seem to be so to modify the "model law" as to assure for it the support of all elements within the profession. These modifications should be conceived with but a single purpose, viz.: The adequate protection of the public against incompetence and fraud. There should be no attempt to bring within the law those whose registration is not essential to that purpose. Subject to these fundamentals they should be so drawn as to reflect practical considerations as exemplified in the legislation thus far enacted.

The "Model law" brings within its scope all persons who do any of the things included within the definition of professional engineering, even though they do it without compensation. It provides:

That in order to safeguard life, health, and property, any person practicing or offering to practice the profession of engineering, . . . shall hereafter be required to submit evidence that he is qualified so to practice and shall be registered as hereinafter provided; and it shall be unlawful for any person to practice or offer to practice the profession of engineering, . . . in this state, or to use in connection with his name, or otherwise assume, use, or advertise any title or description tending to convey the impression that he is a professional engineer . . ., unless such person has been duly registered or exempted under the provisions of this act.

Section 2 defines the term "professional engineer" as one who is qualified to engage in engineering practice. It then defines engineering practice in detail, but with complete omission of any reference to holding one's self out to the public for hire as a professional engineer, thereby including all qualified engineers.

Section 17 provides that corporations, etc., may practice professional engineering only if such practice is carried on by registered engineers.

It exempts, section 20 (c), an employee or a subordinate of a person holding a certificate of registration "provided his practice does not include responsible charge of design or supervision." By inference it does not exempt such an employe or subordinate if the practice is consultation, investigation, evaluation, or planning—only design or supervision.

Unless some modification is made it would appear to be impossible for anyone not now meeting the requirements for a licensed engineer ever to become one. The law requires 4 or more years of active practice. The candidate cannot individually practice engineering without a license, the employer can use only licensed engineers and "the mere execution, as a contract, of work designed by a professional engineer, or the supervision of the construction of such work as a foreman or superintendent shall not be deemed to be actual practice in engineering work." (Model Law).

These provisions should be clarified to express accurately the intent, but one thing seems evident: The title "engineer" may not be used by anyone save under registration. Naturally the exemptees are debarred.

Surely the desire of the profession and of the individual will be that the title be employable, once qualification has been established, and subject only to the purposes of the legislation.

This clarification would result if the sections were reworded somewhat as follows:

Section 2. Definitions. The term "professional engineer" as used in this Act shall mean a person who, by reason of his knowledge of mathematics, the physical sciences, and the principles of engineering, acquired by professional education and practical experience, is qualified to engage in professional engineering practice as hereinafter defined and holds himself out to the public for hire as practicing professional engineering.

The practice of professional engineering within the meaning and intent of this Act includes any professional service to the public for hire, such as consultation, investigation, evaluation, plannng, design or responsible supervision of construction or operation, in connection with any public or private utilities, structures, buildings, machines, equipment, processes, works, or projects, wherein the public welfare, or the safeguarding of life, health or property is concerned or involved, when such professional service requires the application of engineering principles and data.

Section 17. Firms, Partnerships, Corporations, and Joint Stock Associations. A firm or a co-partnership, or a corporation, or a joint stock association may engage in the practice of professional engineering in this State, provided only such practice is carried on under the general supervision of a professional engineer, registered in this State.

Section 20. Exemptions. The following persons shall be exempt from the provisions of this Act, to wit:

(c) An employee or a subordinate of a person holding a certificate of registration under this Act or of any firm, copartnership, corporation, or joint stock association, authorized to practice professional engineering in accordance with the provisions of Section 17 hereof, or an employee of a person exempted from registration by classes (a) and (b) of this Section.

As to state practice in exemption: the analysis of 26 states made by Western Society of Engineers indicates that the laws as enacted in all except 6 specifically permit corporations, etc., to engage in the practice of professional engineering, provided those in responsible charge of the work are registered.

21 States exempt employees of registered engineers, 13 inqualifiedly, and 8 including the qualification that the work does not involve responsible charge. One which does not so exempt does exempt engineers employed by railroads or other interstate corporations whose employment is confined to such corporation. Other exemptions run to employees of public service corporations in varying terms.

Engineers Should Evolve the Standards

The "model law" provides for the setting up of standards by the states. Will not the dignity and standing of the profession be enhanced if it evolves for itself the standards which qualify for the title of "engineer"? Would not there be more assurance of appropriate standards and of their maintenance and uniformity than through legislative enactment? It is true that states may not delegate their powers unduly, but would not such a self-evolved standard lead in the fixing of state standards? Should not the profession actively forward the establishment of such a standard?

A procedure under contemplation by the E.C.P.D. would seem to provide a basis for such self-determination. Briefly it proposes:

1. The preparation by agreed methods of a list of approved engineering schools (the legislation demands such a list) and a uniform procedure in the granting of degrees.

2. Certification into the profession of engineering (carrying the right to use the title of engineer and to corporate membership in engineering societies) only after a period of practical experience and the establishment of qualification by examination or the equivalent.

3. Qualification standards to be at least equivalent and probably exceeding those established by legislation.

There is warrant for these changes in the legislation. The admitted animating purpose is the protection of the public against incompetency and fraud. A "certified" member of the profession in private employment could not be held incompetent if the standards on which his certification is based equalled or exceeded those of the legislation. His motive and opportunity for public fraud would be nil unless he likewise initiated a public relation and he would then be liable under the law.

It is believed that an embodiment of the suggestions herein made would be a step toward what must be the considered desire of the profession. It would afford the public the needed protection. It would put the profession in the desired dignified position before the public of initiating its standards of and by itself instead of having them imposed by law. It would substitute self determination for forced regimentation. It would make for uniformity of requirement. It would largely remove licensing from the field of political considerations. It would enormously simplify the process of enforcement. It would reduce the cost." Editorial Comment:—

The arguments offered by Mr. Berresford are well set forth. However, no argument predicated upon questionable premises can develop correct conclusions except by an error in reasoning.

Mr. Berresford assumes that the practicing engineers not directly representing public agencies are of no consequence to the general welfare. This is a grave and dangerous error. There is no engineering activity that does not, in some manner, affect the life, health or property of persons. Are not the activities of private individuals or corporations concerned with light, heat, power, transportation, communication, water supply and other features of modern existence, matters involving life, health and property. Cannot chemistry and electricity be destructive agents as well as aids to society?

No, Mr. Berresford, the question of licensing is not primarily a professional one. It is a matter of public concern. Even an individual should be prevented from playing with the forces of nature, unless he is as competent, morally and mentally, as society can make him.

A SCIENTIFIC MONEY SYSTEM

(*Continued from page* 13)

commodity (gold or silver) will as already stated, have always a varying purchasing power in different countries and at different times. Under these circumstances a universal international money unit or currency of constant value in all countries will remain a chimera.

The international economic conference now in session at London should consider that it is far simpler and more just to let every country have its own stable money unit for domestic trade, based on the principle of the Scientific Money System, and let the relation of the different money units to each other and to gold *as a common denominator*, be determined by the exigencies of international trade, and not by arbitrary prescription, through a conference, to be applied also to domestic trade.

It stands to reason, that larger population units (larger States) are more favorable for stability of money value than the same population split up into separate units or nations. In this respect the United States will have a great advantage over the nations in Western Europe. Its dollar will be more stable than the pound, franc, mark, and other money units. It may thus dominate the money market, not only to its own but to the advantage of all nations. But whether it does or not it is of infinitely greater importance that the dollar for domestic trade shall be stable than that the nation as a whole shall be exposed to the vagaries of international trade and exchange.

The most pressing need, however, is now for some simple plan fitted with some modifications into the present United States banking system to overcome the scourge of unemployment. For this the following plan is proposed as a transition to Government money and Government banking, which remains to be organized along the lines indicated in the essay, and is not further attempted herein.

Plan for Curing Unemployment And the Business Depression

It must be recognized, that a return to the hectic prosperity period (1922-1929) which gradually permeated the whole population with debts, is impossible and that there should be a change back to somewhere the normal and balanced conditions of business, which prevailed for 10 years before 1914; also that the time has come when capital take less, so that labor may have more.

Allowing for the higher taxes caused by the war, the restoration of the national income may require a transition period of several years. It should begin with a reduction of interest on public and private indebtedness, voluntary or by law, to ameliorate the distress from foreclosures and bankruptcies, and next with the putting the unemployed to work in the field of constructing permanent structures of public benefit, of which there is no end if properly organized, but which private capital will not undertake because the profit from it is either absent or too precarious. Therefore, a speedy and extensive re-employment of labor from that source cannot be expected, particularly so if the revival program should propose immediate higher wages for the sake of greater purchasing power and thus start again the spiral of rising cost of living, even before many millions of willing workers, near starvation, can buy sufficient food.

The fact will be, that many men and women will have to change for a time their vocations and learn new trades, to make any kind of living at all. This will come without much trouble, provided that they can earn enough money at once to pay at least for necessities. The money must be *provided by the Government* speedily and in ample quantity. It should not come from private capital through a Government bond issue with high interest and amortization from taxation.

1. Let the Federal Government use its own credit, which is higher than any other credit, (public or private) and create a revolving capital fund of not exceeding 10,000 Million Dollars in the form of certificates of construction (denominations from 500 to 100,000 dollars) not intended for circulation like currency but suitable for bank deposits from which to pay for all land, labor, and materials going into the creation and maintenance and repairs of actual wealth and *into nothing else.*

2. These certificates shall represent working capital, available to any employer of labor, at 2% annual interest, which interest shall be paid into the United States Treasury and be applied to the reduction and amortization of the National debt. It means, that the usual method of the Government—exchanging its bonds for private credit and pay interest thereon—shall be reversed. That revolving fund will thus not only create new wealth but simultaneously aid in the reduction of national indebtedness.

3. These two operations can be combined only, when the Government becomes its own banker independent of private capital. In this manner the rates of interest and amortization on long term investments can be low, while *profits* as a reward for enterprises and management would not be limited, but being subject to competition may after a time decrease, leaving the amortized capital to be applied to new investment at low interest and thus lead to continuous employment of labor at fair wages and preserving its purchasing power.

4. These certificates to be used first in payment for all such public federal construction work (including ships for the navy) which at present is paid for from federal taxes. The amount is now from 700 to 800 Million per year. Take this amount out of the budget and substitute the 2% amortization therefor. This will help to reduce taxes and balance the budget for several years, until with returning normal conditions it can be balanced from taxes alone, as it should be, without certificates for these items. It may take a few years to feed the 10,000 Million Dollars into the banks and take the place of present bank credit, which will enable business to gradually return, without a bond issue, to normal business conditions.

5. Certificates, or bank checks drawn against them, to be a legal tender (at their face value) for all taxes (federal, state, and municipal) and all private and public debts. This will keep them at par with present money, which could be gradually displaced with neo-dollars, having aprpoximately the same purchasing power as the gold dollar in 1913-14. Certificates to have no value outside of the United States. This will keep them home and leave the dollar unaffected by foreign exchange money conditions.

6. Loan these certificates to States and Communities, likewise for construction or repair of their permanent public structures at 2% annual interest, to be paid by them into the United States Treasury from their taxes towards the reduction of national debt until loan is in that way fully repaid.

7. The certificates would also be used for the purchase of going farms at foreclosure or mortgage sales, and then leasing the farm (preferably to the former owner) at low interest—say 3 to 4 per cent, which shall likewise be used for the reduction of the national debt. When purchase price is thus fully repaid the title to farm to go to the lessee.

8. These certificates could further be used by the Reconstruction Finance Corporation as loans for, or in payment of construction of self-liquidating and self-supporting projects. If these are undertaken with private capital they must pay higher rates of interest, which increase the cost of operation and slow up amortization in the second place. This is contrary to the aim of national economics, which should be lowest cost of construction and operation and speedy amortization. If the project can afford to pay more than 2%—say 4%—then the loan would be extinguished twice as fast. In addition thereto, the project should be a permanent local taxpayer like other revenue-producing property.

9. The earnings of projects in Government ownership can, therefore, be much less, in fact only 1/3 of those with private capital, and yet contribute continually to the reduction of the national debt and the maintaining the national credit on a high level. While projects built with private capital, even when profitable, contribute *directly nothing* to the reduction of the national debt.

10. The effect of these certificates will be plenty of cheap working capital to pay for labor and material, without an increase of currency, of which the present amount of 40 to 50 dollars per capita in addition to checks is quite sufficient for ordinary transactions.

A further effect will be a reduction of interest rates, to less than 3% *on all capital* through competition with Government credit. This will tend to reduce the crushing burden of interest on the colossal debt of about 203,000 Million (federal, state, communal, and corporate) and aid in its speedy reduction and amortization. Until this is done no true prosperity can come.

11. Strong objections may be expected from the banks, who would lose certain banking profits from 10,000 Million dollars, if obtained from the sale

of Government bonds. Banks would of course be entitled to a small fee to cover administrative expenses for deposited certificates; in addition they could make a profit from loans (against good collateral) at low rates of interest on the deposited certificates, which in practice would take the place of bank credits, as a fund for checks. This will save many millions in interest to borrowers.

12. Because the certificates would decrease profits to the banks, they may be decried as inflation, like the old green backs, but this would be a misrepresentation. The certificates would not circulate like currency without charge, on the contrary they would be subject to a 2% tax, as stated above, which would go to reduce the national debt and maintain the Government credit at the highest pitch. In practice the tax would take the form of a stamp for ½% to be affixed to the certificate every three months.

13. The usual method of the Government for raising money in times of need through the sale of Government bonds to private capital and paying high interest thereon from taxation is a very costly device, profitable to capital and bankers, and inherited from a time when Governments were poorly organized for fiscal affairs. Modern Government has unlimited taxing power and its credit when protected by the six conditions discussed in the thesis will always be higher than any private or bank credit, even with a veneer of gold. Therefore, it has at least as good a right to charge interest as has private credit.

14. The above-proposed transaction by the Government should pave the way in the present depression for the reorganization and Government ownership of banks and the replacing of the very costly and complicated present bank system in the United States with a simpler and more efficient banking system, based on Government credit with money of stable value and working capital at permanent low rates of interest. Such a banking system is indicated in the discussion of the third condition in my thesis.

15. That the present gold standard and credit systems of money lend themselves too readily to speculative expansion and dishonest manipulation without much regard to the intrinsic value of merchandise, labor, or property, and to the incurrment of huge state and municipal indebtedness for extravagant and unproductive expenditures, which increase the burden of taxation, should now be clear to the victims of these systems, which robbed them of their savings and their homes. With the Scientific Money System, as described in my thesis and rigidly enforced, this could not happen.

16. Let the people and specially the growing-up youth, which will succeed to Government, adopt the slogan: *"KEEP OUT OF DEBT, IT IS SLAVERY."* It should apply to all public and private indebtedness and be posted on the walls of our schools and colleges and legislative halls. The unsophisticated wage and salary workers should be warned against extravagance and alluring installment payments, collection of which, on merchandise, should be outlawed. Save your money and pay cash for what you buy, it will promote thrift and of itself will prevent and balance over-production and under-consumption, and thus be one of the most effective antidotes to speculation and business depression, unemployment and want in old age.

THE 74th CONGRESS

(*Continued from page* 10)

menting bodies, usually with special motives. We are, or might be concerned with the general motive. And we might find that we could get to know much more about it than the bankers do.

The Soil Erosion Act

Concerns soil conservation on the principle that though carried out on non-Governmental lands, the program will protect public lands. It establishes the Soil Conservation Service.

This service would seem really to be an engineering body. At least the problem of soil erosion is an engineering one; it is created by natural forces.

The Labor-Relations Act

Creates a permanent National Labor Relations Board of three members, to promote equality of bargaining powers between employers and employes and to diminish the causes of labor disputes. Declares collective bargaining to be a national policy. Sets up five enumerated unfair labor practices affecting commerce. Does not deny the right to strike.

Evidently an experimental enactment to provide a new base of evaluating labor relations. The professional engineer will be interested in the results of this experiment, although his interest will usually be that of his employer. The engineering profession as a body will not be directly interested, excepting as minority groups in the profession appear to see an interest for the profession as a whole.

The Employment Service Act

Provides money for the establishment by the States of local agencies of the United States Employment Service. Gives each State $10,000 for this purpose.

So far the activities of the local offices of the National Employment Service seem to be confined to relations with the Works Progress Administration. Professional Engineers, especially those receiving home relief, are using these offices, sometimes in connection with the employment agencies of the engineering bodies. As conditions in the country improve, probably the calls for professional engineers for employment will come principally through the private agencies of the engineering societies. The National Employment Service seems designed more for men and women in skilled and unskilled occupations than for professional people.

The Central Statistical Act

Provides a Central Statistical Board to improve, coordinate, and develop all statistics collected by the Government, and to eliminate duplications.

This job would have been a fine one for the engineering profession to be assigned to undertake. No legal practice is required to execute such a job, and the job is non-political. It is an engineering job. We should have been there, and proposed the job ourselves. Then we might have secured the assignment of it.

The War Department Supply Act

Appropriates 400,000,000 dollars for the national defense, of which an amount is directly assigned to increase the enlisted strength of the National Guard, and another amount for the Reserve Officers Training Corps for training 30,000 men in citizens' military training camps.

Of interest to professional engineers, many of whom will take the opportunity for such training.

The Wilcox Air Base Act

Authorizes the study of possible air fields for peace-time training. An engineering job, and one with which several engineers will probably contact locally. Engineering societies and clubs might well have a copy of this act on hand for reference by their members.

The Oil and Gas Prospecting Act

Allows the Secretary of the Interior to grant permits for prospecting.

Of interest to engineers in this industry and in land in oil regions.

The Social Security Act

Provides for the establishment of a governmental system of old age pensions, as everyone knows since the issue of provision for old age is one for most of us personally.

Every intelligent citizen might well provide himself with a copy of the act and keep it among his papers.

The Rail Extension Act

Continues the office of the Coordinator of Transportation. This is the job of a professional engineer, but a business man seems to be handling the job satisfactorily, at least to the Government at the present time.

THE NATIONAL SOCIETY OF PROFESSIONAL ENGINEERS

(*Continued from page* 7)

panies and their employees from all provisions of the engineers' registration laws.

5. In 1935, the Ohio Society and its local chapters successfully formulated and adopted governing codes for standardization of engineering practices, schedules of standard fees for professional services, and uniform and standard contracts to be used by engineers in private practice.

NEW YORK

1. In 1935, the New York State Society of Professional Engineers secured significant legislation prohibiting the practice of engineering by any new corporations and the formation of new "engineering" corporations, and restricting the practice of engineering by any previously existing corporations so as to require the chief executive, all engineering employees, and all employees designated as "engineers" to be licensed professional engineers.

2. In 1935, the New York State Society successfully opposed and stopped legislation for the licensing of "stationary engineers," on the ground that it would establish a misapplication of the designation "engineer."

PENNSYLVANIA

1. In 1935, the Pennsylvania Society of Professional Engineers successfully opposed and stopped proposed amendments (H.R.1750) to the architects practice act which would have deprived engineers of the right to file plans and applications for building permits, to obtain building permits, to design buildings and to supervise their construction.

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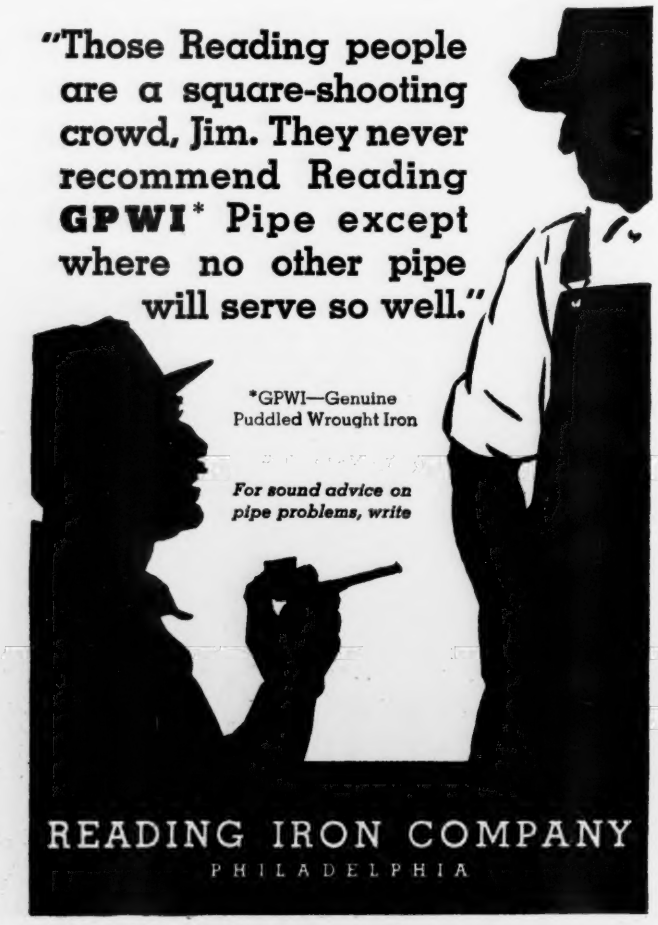

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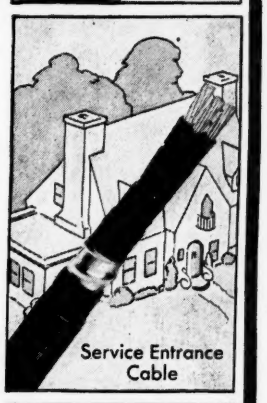

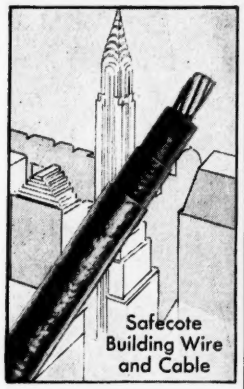

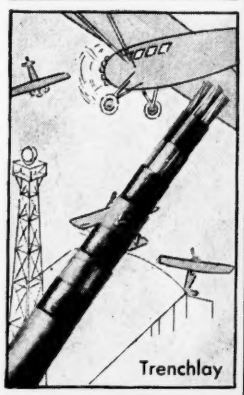

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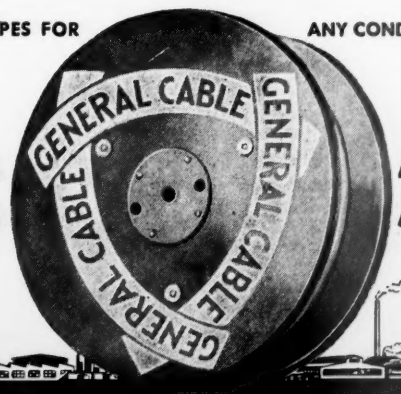

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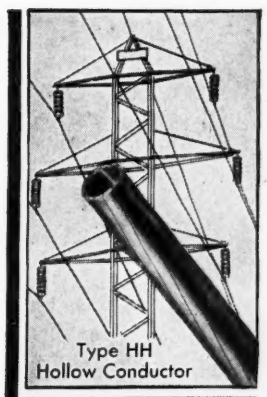

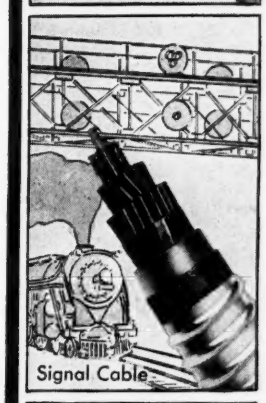

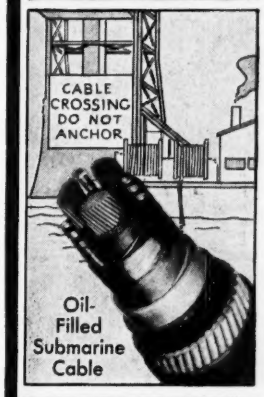

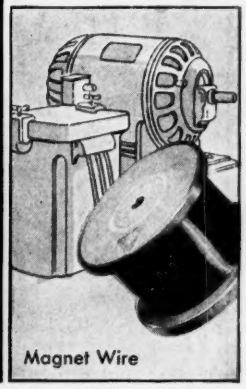

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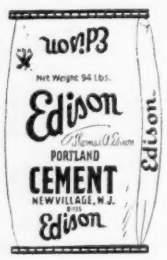

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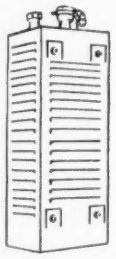

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